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AMERICAN STATISTICAL ASSOCIATION

MARCH, 1928
Supplement

PAPERS AND PROCEEDINGS

OF THE

EIGHTY-NINTH ANNUAL MEETING

OF THE

AMERICAN STATISTICAL ASSOCIATION

Held at Washington, D. C.
December 27–29
Nineteen Hundred and Twenty-Seven

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SUPPLEMENT

PROCEEDINGS OF THE AMERICAN STATISTICAL ASSOCIATION

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EIGHTY-NINTH ANNUAL MEETING

THE EIGHTY-NINTH ANNUAL MEETING OF THE AMERICAN STATISTICAL ASSOCIATION,
HELD AT HOTEL WASHINGTON, WASHINGTON, D. C.,
TUESDAY, DECEMBER 27, TO THURSDAY, DECEMBER 29, 1927.

PROGRAM

TUESDAY MORNING, 10.00 (Rose Room)

Federal Statistics as Viewed by the Social Scientist

Presiding Officer: Joseph A. Hill, United States Bureau of the Census

Papers:

"Some Observations on Federal Agricultural Statistics"
Joseph S. Davis, Food Research Institute, Stanford University

"Some Desirable Changes in the Federal Census of Manufactures"
Woodlief Thomas, Federal Reserve Board

"The Census of Distribution"
Melvin T. Copeland, Harvard University

Discussion:

Jesse W. Tapp, Bureau of Agricultural Economics, Washington, D. C.
Leon E. Truesdell, United States Bureau of the Census
[1] Nathan B. Williams, National Association of Manufacturers
William J. Carson, Federal Reserve Board

TUESDAY AFTERNOON, 2.30 (Hall of Nations)

Post-War Price Movements

(Joint Session with the American Economic Association)

Presiding Officer: Walter F. Willcox, Cornell University

Papers:

[2] "Post-War Fluctuations of Commodity Prices"
Lionel D. Edie, University of Chicago

"Post-War Prices and Pre-War Trends"
Frederick C. Mills, National Bureau of Economic Research, New York City

Discussion:

[2] Charles O. Hardy, Institute of Economics, Washington, D. C.
[1] Carl Snyder, Federal Reserve Bank, New York City
[2] Edwin W. Kemmerer, Princeton University

[1] No manuscript was submitted.
[2] Will be published by the American Economic Association.

TUESDAY EVENING, 8.00 (Hall of Nations)

Presidential Addresses

Presiding Officer: Edwin W. Kemmerer, Princeton University

Papers:

[1] "Labor Legislation and the Business Mind"
Sam A. Lewisohn, American Association for Labor Legislation

[2] "Statistics and Business Forecasting"
Edmund E. Day, American Statistical Association

[3] "Ideals and Idealism in Taxation"
Thomas S. Adams, American Economic Association

WEDNESDAY MORNING, 9.00 (Rose Room)

Business Meeting

Election of Officers and Official Reports

WEDNESDAY MORNING, 10.00 (Rose Room)

Technical Problems of Index Number Making: An Experience Meeting

Presiding Officer: Royal Meeker, New Haven, Connecticut

Paper:

"Some Fallacies Concerning Index Numbers"
Willford I. King, New York University

Experience Reports:

Robert W. Burgess, Western Electric Company
Frank B. Cliffe, General Electric Company
W. Floyd Maxwell, Harvard Committee on Economic Research
Joseph E. Pogue, Petroleum Engineer, New York City
[4] Carl Snyder, Federal Reserve Bank, New York City
O. C. Stine, United States Department of Agriculture
Woodlief Thomas, Federal Reserve Board

WEDNESDAY AFTERNOON, 2.30 (Hall of Nations)

The Place of Statistics in Training for Business

(Joint Session with the American Association of Collegiate Schools of Business)

Presiding Officer: Edmund E. Day, University of Michigan

Papers:

"The Quantitative Background of Business Science"
William L. Crum, Stanford University

"Some Suggestions for the Use of Statistics in Courses in Banking"
Horace Secrist, Northwestern University

"A Fundamental Problem in the Case Method of Instruction in Statistics"
Olin W. Blackett, University of Michigan

"The Objectives of Business Statistics"
Theodore H. Brown, Harvard University

Open Discussion

[1] Will be published by the American Association for Labor Legislation.
[2] Published in the JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION, March, 1928.
[3] Will be published by the American Economic Association.
[4] No manuscript was submitted.

THURSDAY MORNING, 9.00 (Sun Parlor)

Business Meeting

Reports of Committees and Other Business

THURSDAY MORNING, 10.00 (Spanish Garden)

A—Business Forecasting

Presiding Officer: Leonard P. Ayres, Cleveland Trust Company

Papers:

"A New Method of Presenting a General Business Index and Forecast"
Norman J. Silberling, University of California

"Short-Term Forecasting of General Business"
F. Ernest Richter, American Telephone and Telegraph Company

[1] "Forecasting Changes in the Prices of Securities"
Albert J. Hettinger, E. E. MacCrone and Company, Detroit

[1] "Kinetic Business Forecasting"
Walter A. Baude, University of Cincinnati

Open Discussion

THURSDAY MORNING, 10.00 (Sun Parlor)

B—Statistics of Crime

Presiding Officer: Charles E. Gehlke, Western Reserve University

Papers:

"The Need for Adequate Criminal Statistics"
Louis N. Robinson, Swarthmore College

"The Problem of Collecting and Standardizing Statistics of Crime in Forty-eight Sovereign States"
Leon E. Truesdell, United States Bureau of the Census

"Crime Statistics as a Police Problem"
Lent D. Upson, Bureau of Governmental Research, Detroit

Open Discussion

THURSDAY AFTERNOON, 2.30 (Rose Room)

A—Round Table on the Best Index Number for Stabilization Purposes

(Joint Session with the Stable Money Association)

Presiding Officer: Edwin W. Kopf, Metropolitan Life Insurance Company

Papers:

"The Best Index Number for Stabilization Purposes"
Hudson B. Hastings, Yale University

"The Best Index for Use in Stabilizing the Price Level"
Willford I. King, New York University

Discussion:

Miriam E. West, New Jersey College for Women

[1] No manuscript was submitted.

THURSDAY AFTERNOON, 2.30 (Spanish Garden)

B—Statistical Evaluation of the Results of Social Experiments

Presiding Officer: Robert E. Chaddock, Columbia University

Papers:

"The Statistical Evaluation of the Results of Social Experiments in Public Health"
Edgar Sydenstricker, United States Public Health Service

"An Experiment in the Evaluation of Social Case Work"
Porter R. Lee, New York School of Social Work

"Effectiveness of Life Imprisonment as a Repressive Measure Against Murder in Rhode Island"
Harold A. Phelps, Brown University

Open Discussion

SOME OBSERVATIONS ON FEDERAL AGRICULTURAL STATISTICS

By Joseph S. Davis

I have been drafted to present some observations on the agricultural statistics published by the Federal Government, from the viewpoint of a "consumer" of those statistics. I do not pose as an authority on the subject; I have unfortunately been unable to be in Washington during the preparation of my paper; the field is so vast that I cannot pretend to exhaust it; but I will not waste valuable minutes in praying forgiveness for sins of omission and commission or in defending my somewhat random selection of high spots. I count upon the discussion to supplement as well as to correct my statement.

AN APPRECIATION

First I must express, with emphasis and without flattery, cordial appreciation of the valuable work of both the Census Bureau and the Department of Agriculture—notably the Bureau of Agricultural Economics—in the field of agricultural statistics. For furnishing primary data of increasing scope in summarized form and in considerable detail, for analyses and estimates, for contributions to statistical method, and in many other ways the "consumers" of agricultural statistics, and indeed statistical workers in general, owe a great and increasing debt to the Federal Government. No other country today, I believe, is so well served, and the results are increasingly evident in a surer grappling with agricultural problems by the individual farmer and research worker, if not yet so obviously in respect to legislation.

The taking of an inter-decennial census of agriculture; the monthly reports on cotton ginned and flour milled; quarterly reports on stocks of wheat and other cereals, hides and skins, and fats and oils; the biennial censuses of manufactures covering the use of agricultural products as materials; the new series of census monographs: All these represent significant additional contributions from the Census Bureau of great value to users of agricultural data. The *Agriculture Yearbooks*, *Crops and Markets*, *Foreign Crops and Markets*, and special bulletins and mimeographed materials of the Department of Agriculture are full of excellent data of broader scope and better quality than were formerly available. Special mention should be made of improvements in methods of crop and livestock estimation; compilations of weekly visible supplies of cereals; various indexes of farm prices, farm wages, farm

real estate values, etc.; estimates of agricultural income; analyses of the world situation in various commodities; outlook reports; price analysis studies; experiments with multiple correlation, etc. In increasing measure much of this material is proving of direct value to farmers and business men, apart from its bearing on economic and political problems.

I am also impressed by the comparative absence, in these bureaus, of a spirit of complacent self-satisfaction. A proverbial tendency in governmental statistical work—to say, "We have always done thus and so; let well enough alone"—is certainly not characteristic of these organizations today. There is a commendable readiness to admit limitations, deficiencies, and even errors in statistical data, methods, and interpretation, and to welcome—so far as anyone can be said to welcome—criticisms and suggestions. This is as it should be, but it is none the less a matter for congratulation. Especially in the Bureau of Agricultural Economics there has been developed in recent years a group of research workers who command high respect as such, and who display a competence and a progressive, scientific spirit which reflect great credit on the Department leaders as well as on themselves. Their researches have done and are doing much toward bringing current agricultural statistics up to the standards required by all research workers.

Of these things I will say no more; but whatever I say in criticism of the federal agricultural statistics should be understood against this background of respect and admiration. Withal, however, we are gratified but not satisfied, and I venture to think that our craving represents something more rational than the cry of a pampered child for the moon.

SOME SHORTCOMINGS IN BASIC DATA

(1) *Crop Acreage and Production.* Among the most basic census data are those on crop acreage and production. Here, if anywhere, the consumer of statistics must rely heavily upon the census. I regret to say that careful investigation shakes one's confidence in these census figures as available over a period of 60 years. It is too much to expect even a census enumeration to be complete, though we are prone to assume that it is. But there is evidence of material variation in incompleteness from state to state and from census to census. This gives real cause for concern.

Some years ago, in plotting annual data on wheat acreage, as revised by the Department of Agriculture on the basis of census figures, I was struck by the fact that changes in trends occurred conspicuously at the census years—which I could hardly accept as inherently probable.

Later, Holbrook Working found that census data on wheat acreage by states showed inconceivable shifts in levels, implying overstatements or understatements in particular censuses.[1] The Department's published revision of annual estimates of crop acreage in New York State [2]—intended as a model for similar revisions of similar data for all the states—strongly suggests errors in census data for which no correction was attempted. The production data, which in many cases can be checked by data on disposition, derived in some cases from more adequate censuses of manufactures, are much more defective than the acreage statistics. If such figures are as defective as we suspect, the raw material for historical studies of many kinds, including newer types like price analyses and indexes of physical production, cannot safely be used for such purposes, and many such studies already made are weak in their very foundations.

Some of the worst difficulties arise in the 1890's, but latest figures do not command confidence. The published data of the agricultural census of 1925 leave one greatly troubled on this point. Consider Table I, comparing census figures for acreage and production of certain

TABLE I

ACREAGE AND PRODUCTION OF CERTAIN CROPS IN 1924, ACCORDING TO CENSUS REPORTS AND REVISED ESTIMATES OF THE DEPARTMENT OF AGRICULTURE *

Crop	Area Harvested (thousand acres)			Production (thousand bushels)		
	Census	U. S. D. A.	Difference (per cent)	Census	U. S. D. A.	Difference (per cent)
Winter wheat	34,360	35,656	+ 3.8	553,377	592,259	+ 7.0
Spring wheat	16,503	16,879	+ 2.3	247,499	272,169	+10.0
Total wheat	50,862	52,535	+ 3.3	800,877	864,428	+ 7.9
Rye	3,744	4,150	+10.8	55,674	65,466	+17.6
Barley	6,767	6,925	+ 2.3	159,139	181,575	+14.1
Oats	40,819	42,110	+ 3.2	1,304,599	1,502,529	+15.2
Flaxseed	3,435	3,469	+ 1.0	28,246	31,547	+11.7
Rice	744	850	+14.2	29,526	32,498	+10.1
Peanuts	1,105	1,187	+ 7.4	26,899	745,059[a]	+25.9
Hay	74,096	76,352	+ 3.0	88,384[b]	112,481[b]	+27.3
Cotton	39,204	41,360	+ 5.5	13,683[c]	13,628[c]	− 0.4
Tobacco	1,538	1,706	+10.9	1,106,340[a]	1,251,343[a]	+13.1
Potatoes	2,911	3,327	+14.3	352,462	421,585	+19.6
Sweet potatoes	467	688	+47.3	37,444	53,912	+44.0

* Data from *Census of Agriculture, 1925*, and *Crops and Markets, Monthly Supplement*, December 1926.

[a] Thousand pounds. [b] Thousand tons. [c] Thousand bales.

crops with revised estimates subsequently published by the Department of Agriculture. The Department's figures for acreage are 2 to 4 per cent higher than the census figures, for most crops, and much higher for several of the lesser crops (*e. g.*, rye, rice, potatoes, sweet potatoes,

[1] See the study cited later, p. 8.

[2] *Department Circular No. 373*, April, 1926.

tobacco). The production figures of the Department of Agriculture are much further above those of the census—in wheat 8 per cent, in most other crops considerably more. In each of these cases the Department's revised figures were published after the census data became available, and the difference represents a carefully considered judgment of the understatement in the census data, reached after close study of supplementary information. The Department's figures may not be correct; but there is reason to believe that the difference, in acreage at least, represents a conservative measure of the understatement in the census figures, rather than an overstatement by the Department of Agriculture; and in the case of certain crops the available checks on production estimates, readily available to outside investigators, appear to justify the higher figures of the Department.

These observations lead to two suggestions. In the first place, it is important that measures be taken to increase the accuracy and degree of completeness in future census data on agriculture. This is partly a matter of expense, to which I shall shortly refer. It is partly a matter of organization. The proposal that the task of administering the agricultural census be transferred to the Department of Agriculture would seem to deserve consideration. In any event, census taking in agriculture can presumably be made much more efficient by extensive use of the far-flung organization of the Department of Agriculture and associated state officials.

In the second place, it is quite desirable that historico-statistical studies be made, in the Census Bureau or Department of Agriculture or outside, that will lead to carefully checked and reasonably reliable revisions, state by state, for a considerable series of past years, in the statistics of acreage and production of various crops, which could henceforth be used for many purposes rather than the data as reported by the successive censuses. Outside investigators can contribute something toward such revisions, especially in the way of experiments in technique and provisional approximations;[1] but the task is a formidable one, and for its successful completion the resources of the Census Bureau and the Department of Agriculture must be utilized in ways that are not open to unofficial investigators. In addition to their direct value, such studies would incidentally contribute toward improvements in subsequent census data.

(2) *Livestock and Animal Produets.* Among the weakest elements in our agricultural statistics are the data on animal population, and the production of meat, lard, milk, butter, and other animal products. In

[1] An example is Holbrook Working's revision of official estimates, for the whole country, of wheat acreage and production since 1866, in *Wheat Studies of the Food Research Institute*, June 1926, II: pp. 237–64.

the aggregate the output of the animal industries represents, as you know, a large and increasing portion of the total value of agricultural products.

The census gives figures for animal population. Unfortunately there have been two changes of date, and another is under consideration: For the years 1850 to 1900 the figures are as of June 1; for 1910 as of April 15; for 1920 and 1925 as of January 1. So great may be the changes in the animal population in these intervals—from births, slaughter, and deaths from natural causes, and also in location—that the figures for different dates are not properly comparable. This is particularly the case with calves, sheep and lambs, and swine. Moreover, these census data, like those on crop acreage and production, are believed to be incomplete in varying degrees in different states and at different censuses. Furthermore, such are the shifts from one year to another in several classes of animals that accurate decennial or even quinquennial figures may give erroneous indications of trends. Annual data are essential.

For recent years a division of the Bureau of Agricultural Economics has developed improved methods for preparing annual estimates as of January 1, more or less independent of the census figures. Its latest revised figures, as shown in Table II for certain groups of animals for

TABLE II

LIVESTOCK COUNT JANUARY 1, 1920 AND 1925, ACCORDING TO CENSUS REPORTS AND REVISED ESTIMATES OF THE DEPARTMENT OF AGRICULTURE *

(Thousands)

Class	January 1, 1920			January 1, 1925			Change, 1920-25	
	Census	U. S. D. A.	Difference (per cent)	Census	U. S. D. A.	Difference (per cent)	Census	U. S. D. A.
Horses	19,767	19,848	+ 0.4	16,401	16,489	+0.5	−3,366	−3,359
Mules	5,432	5,475	+ 0.8	5,681	5,725	+0.8	+ 249	+ 250
Cattle and calves	66,640	68,871	+ 3.3	60,760	61,996	+2.0	−5,880	−6,875
Sheep and lambs	35,034	40,243	+14.9	35,590	38,112	+7.1	+ 556	−2,121
Swine	59,346	59,813	+ 0.8	50,854	55,568	+9.3	−8,492	−4,245

* Data from *Census of Agriculture, 1925, Crops and Markets,* and *Agriculture Yearbooks.*

January 1, 1920 and 1925, are in all cases above the census figures for the census dates, and in some instances the differences are radical. In the case of sheep and lambs the census figures show an *increase* of sheep and lambs of 556,000, or 1½ per cent, while the Department's figures show a *decrease* of 2,131,000, or over 5 per cent. For hogs, the census data show a decline of 8,492,000, or about 14 per cent, while the

Department's figures show a decline of only 4,245,000, or 7 per cent. The Department's estimates may perhaps be wide of the mark, but when revised with the aid of detailed census data and other resources available to the Department, they are presumably more nearly correct than the census data. The differences noted suggest great danger in relying heavily upon the census data on livestock, and on the Department's interpolations of annual data for the years before the Department had developed its system of estimates to the present stage.

It is clearly advisable to develop further the good work of the Division of Crop and Livestock Estimates, and in particular to devote more effort to research in methods of estimating. It seems possible that the census enumerations in this field will in future have their principal value in affording checks upon the Division's estimates and in giving a degree of regional detail which the estimates cannot furnish except at prohibitive cost. But for this purpose also it is highly desirable that the collection of the census data be made with the utmost advantage of the Department's knowledge, experience, and organization.

On annual production of meat and other livestock products the information is much less satisfactory than for livestock count. Here the census data must be regarded as much less adequate and accurate than for crop acreage, and probably less satisfactory than for crops produced. The Bureau of Animal Industry prepares annual estimates of meat and lard production, and its series now runs back to 1907. These estimates rest in part on census data for census years and the Department's annual estimates of livestock population, with allowances for losses and estimates of the calf crop—both exceedingly difficult to make—but mainly upon statistics of federally inspected slaughter. For other wholesale slaughter (except as covered by the biennial censuses of manufactures), retail slaughter, and farm slaughter, which in the aggregate are very important, there are no data except the inadequate and not highly reliable figures given by the censuses of 1910 and 1920. In default of information, the Bureau has felt it necessary to proceed on the very dubious assumption (with certain modifications) that the proportion of federally inspected slaughter has remained about as it was reported for 1909, and that the total slaughter bears the same ratio to livestock population that was indicated by the inadequate data for 1909. Further difficulties arise in that the amount of meat (and lard) produced per head of animals slaughtered is not known, except through annual figures of federally inspected slaughter and biennial censuses covering wholesale slaughter. The practice of applying these ratios to estimated total slaughter is admittedly defective. Under these circumstances one can say—without in any way reflecting upon the

intelligence with which the estimates are made—that our statistics of animal slaughter and meat production and consumption may be, and probably are, quite wide of the truth. For dairy and poultry products the case is no better, and in some respects perhaps even worse.

Here is a serious gap in statistics of large importance for the trades concerned, for students of agriculture and food consumption, and for price analyses. The essential thing is to obtain more adequate basic data upon which to base the necessary estimates, and thus to reduce the area within which estimates must be resorted to. Among other things, new census data on retail slaughter and farm slaughter, more information on weight of animals slaughtered and ratios of dressed weight to live weight, are urgently needed. The problem of preparing reliable estimates should be frankly faced, and steps outlined for securing the basic materials essential to reaching this result.

ESTIMATES AND ANALYSES

Some of the notable advances in recent years, especially in the Bureau of Agricultural Economics, have been made in the construction of estimates and analyses designed to throw light on situations which cannot adequately be revealed by mere collections of data. Apart from the direct value of its results, this work reacts favorably upon the collection of basic data. Defects and deficiencies are revealed; valueless and misleading data are shown up as at least dispensable; and means of improving the data and their collection are suggested. For these reasons as well as for its own sake, more of this sort of work is needed. We can well do with a reduced rate of increase in the volume of data if the selection and quality are continuously improved.

Much of this work can best be done in government offices with the aid of unpublished materials and of other material available in advance of publication. But much of it can be done by outside investigators. For their use it is highly desirable that comments, qualifications, and reservations should be made in connection with published tabulations. This is done to a limited extent, but not as fully as one could wish.

Furthermore, in the case of all important current estimates and calculations, it is greatly to be desired that, in a measure not the rule at present, adequate statements of procedure and working data be made available (at least in mimeographed form) to scientific investigators outside the Department. Supplementary and revised statements should be made when changes in methods are adopted, and substantial revisions in estimates should be explained. This policy would enable these investigators not only to interpret the results more intelligently, with due reservations or modifications, but also to contribute

toward improving the calculations themselves. How far such statements exist in manuscript form within the Department I do not know; certainly they are important there in view of its changing staff, and would be invaluable for future historical studies extending over a long period.

A QUESTION OF BIAS

With some hesitancy I feel bound to touch upon one delicate matter. Can one accept as entirely without bias the statistical data of the Department of Agriculture, in particular where estimates and interpretations are involved? Can one assume that competent scientific investigators outside the Department, with the same resources, would reach substantially the same results as those published?

For the most part I believe the answer is a confident affirmative. I see no evidence that published forecasts or estimates of crops, or forecasts of prices, have been influenced by other considerations than the evidence itself. But there is a danger here, arising not from within the Department but from outside. Some months since, a break in the cotton market was charged up to a Department statement regarding price prospects. The criticism was loudest from spokesmen for the growers, who seem to have felt that the Department was responsible for lowering prices and so acting contrary to the growers' interests. There appears to be a fairly widespread feeling that it is somehow quite objectionable, indeed almost unpatriotic, to predict lower prices, poorer business, or anything that may lead to either, as if the prediction tended to cause the evil to happen. Apparently what such critics would like is a kind of discrimination in forecasts and their statement. The Department must vigorously guard against the temptation to respond to any such pressure. Forecasts of crops, of prices and price tendencies, are at best imperfect, and should certainly be couched in guarded terms. But it will be most unfortunate if condemnations of unpalatable truths, or even of actual errors, should force the Department to slacken its excellent progress in the difficult art of forecasting or cause it to modify the publication or expression of forecasts in the apparent interest of the farmers.

The Department's record in the respects just mentioned is, I think, a good one. I am not quite so comfortable, however, about some data and estimates bearing on the agricultural depression and the current position of the farmers. After all, the Department of Agriculture is rightly expected to have the interests of the American farmer primarily at heart. Decisions as to what work shall be done, and what results shall be published, rest ultimately with a political appointee who must seek to stand well with the farmers. In a period like that of recent

years, when the position of the farmer has been the subject of political agitation, the sensitiveness to reactions of farmers and their spokesmen is keener than usual. Workers in the Department almost necessarily develop, if they did not have it on entering, a strong sympathy with the farming class. Have these conditions resulted in a bias? Let me cite two or three cases.

The Department has for some years published annual summaries of questionnaire surveys of costs of producing leading crops in the major geographical regions. For the first two or three years, there was set against the average cost per bushel the average value per bushel sold by the farmers reporting. As published these figures showed, in most cases until 1924–25, average costs exceeding average returns. In the more recent summaries, however, the figures for average returns have been omitted—partly, I understand, on the ground that the comparison was open to misinterpretation. Now I infer that, had the later figures been obtained and published, they would have shown, in most cases, an excess of returns over average costs. The danger of misinterpretation was apparently effectively realized only when the interpretation was comparatively favorable to the farmer.

Again, some comparisons of average income per farm family and per factory employee in connection with the intricate and valuable estimates of gross income, expenditures, and net income of farmers, are open to question at certain points—among others, in the selection of 1919 as the base year, in counting taxes wholly as costs rather than in part as disposition of income, and in disregarding outside labor income of farmers and unemployment among factory workers. The net effect has been, I believe, to exaggerate the effects of the agricultural depression and the inferiority of the real income of the farm family. Certainly the published results have lent themselves to misuse and misinterpretation in many hands, and not entirely without reason. The same is true, I believe, of the tendency to use the Department's index of the purchasing power of farm products as a major indicator of the farmers' position.

I may be quite wrong, and certainly I would not lay great stress on the point. It is natural and desirable that pains should be taken, in the selection, analysis, and presentation of evidence on the economic and financial position of the farmer, to avoid showing the position in too favorable a light; but I am not sure that equal pains have invariably been taken to avoid showing it in too unfavorable a light. How far this tendency, if it exists, may be due to the statistical workers themselves, and how far to those higher up, I am not in a position to say. In either case I believe that whatever bias may exist is largely uncon-

scious. But both producers and consumers of these statistics need, I believe, to be on their guard against such a tendency. It is one that is not unlikely to crop up in other connections than those I have mentioned in which political considerations may influence the approval or disapproval of material for publication and thus make for a bias in selection even though the bias is not present in the material that is published.

FINANCIAL NEEDS OF THE CENSUS

A final word with regard to the census: I cannot escape the conviction that the Census Bureau suffers from chronic financial malnutrition. It has not enough funds to do well the work demanded of it. It is generally believed that the inadequacies in enumeration in the 1925 census of agriculture were due in no small measure to the low rate of pay for enumerators. The higher level of wages and salaries inevitably involves a higher cost for such work except at the expense of its quality. A stingy policy can only result in a degree of slackness that detracts from the value of the results in a measure quite out of proportion to the quantitative errors or omissions. I believe also, though I have not tried to prove it, that the Census Bureau, even more than many other governmental bureaus, suffers from low salary standards especially in the higher positions. Much of its work is indeed of routine character, but the direction of its work, the formulation of schedules and tabulations, the analysis of its raw data, and maintenance of high standards of collection, checking, and editing, are tasks so exacting as to require highly trained and experienced persons, and a larger measure of methodological research. Some of the needed talent is obtained from special experts or consultants, but the Bureau seems to offer too little attraction to get and hold such persons in sufficient numbers on its own staff. Paradoxically, an economy policy may be very costly.

Another example lies in the destruction of the original census schedules, which are of great value for studying trends of agriculture in various local regions. For lack of storage space these schedules have been destroyed for the 1910 and earlier censuses, and the destruction of the 1920 schedules is imminent. It is a problem worthy of serious consideration by these associations whether the potential usefulness of these raw materials may not justify a policy of storage rather than a policy of destruction.

There is some reason to believe that the Director of the Census and the Secretary of Commerce feel in a weak position to urge really adequate appropriations for the Census Bureau. If so, it is incumbent upon professional associations like those here assembled, whose members draw so heavily upon census data for raw material for significant

research products, and who realize most keenly the importance of quality in the raw material, to bring persuasively to the attention of Congress the importance of appropriating funds ample to secure results of a consistently high standard of quality. The Joint Advisory Committee on the Census does valuable work, but it regards its function as mainly a technical one of advising with the Census Bureau. From this Committee or some other we need such reports to our associations as will enable us to exert effective influence not upon the Bureau itself but upon the public in general and Congress in particular to the end that the work shall be adequately sustained.

DISCUSSIONS OF DR. DAVIS' PAPER

I

By Jesse W. Tapp

With characteristic thoroughness Dr. Davis has presented a very valuable paper on federal agricultural statistics. Unfortunately, the statements regarding the limitations of our basic statistical data are in a large measure true. There appears to be every inclination on the part of federal agencies to use all of the facilities at their command to improve these basic statistics for agriculture. Much progress has been made during the past decade but there remains a very great deal to be done, both in the way of improving present services and in providing much needed extensions.

The task of revising annual data on crop acreages, production, and livestock and livestock products is indeed a formidable one, but it will become more formidable as the years pass and the revised data are badly needed, especially the detail by states. Unfortunately with the present limited facilities available for this work but slow progress is to be expected.

Dr. Davis has expressed quite frankly and in a spirit of helpfulness some fears regarding a possible bias in some of the statistical work of the Department of Agriculture, particularly as to the selection of data to be published and the interpretation of certain evidence regarding the agricultural depression of the past seven years. There is here unquestionably a danger to be guarded against. If the Department is to render its best service to the public or to farmers, it must be free to render its statistical services without fear or favor, either as to farmers or non-farmers.

Being in no way responsible for the data and interpretations which have been mentioned as possible examples of bias may I cite some additional facts regarding these cases. For five years the Department has published summaries of questionnaire surveys of the cost of producing corn, oats, wheat, cotton and potatoes. For the first three years the average prices reported by these same farmers were published alongside the data on costs. Dr. Davis is mistaken, however, in saying that these data showed for the most part costs exceeding returns. In the case of three of the five crops, corn, potatoes and cotton, all of the published data for the country as a whole showed returns exceeding costs. In the case of wheat and oats one of the three years of published data also showed returns exceeding costs. For the later

years corresponding data for corn, cotton and oats would have shown those crops as being produced at a loss while wheat and potatoes would have shown a profit.

Taking into consideration all five of the crops for which data are published simultaneously instead of wheat alone, as Dr. Davis has apparently done, neither end of the picture is particularly more or less gloomy than the other. Hence there would have been no real object in changing the character of the data published for the reason inferred. Indeed, one might with equal justice have used the same data as the basis for an inference that the Department appears interested in presenting too favorable a picture of the situation.

Now as to the reason for the omission of the data on returns from the published data on costs for the past two years. The questionnaire on costs is filled out by farmers in the spring when prices are usually higher than in the fall when marketings by farmers are heaviest. Careful analysis and checking of the price data being obtained with that available from the regular farm price reports of the Department convinced the leader of this project that the prices reported were unduly influenced by the prices prevailing in the spring when the questionnaires were filled out. It seemed desirable on this account to omit the publication of such price data until there was opportunity to obtain data not influenced to so large an extent by the prices at one season and that when farmers' marketings are small. The change was made for the reasons stated and while the division leader was probably consulted I dare say that those higher up will learn of the change for the first time if they chance to read Dr. Davis' paper.

Dr. Davis has also cited what he regards as misleading and subject to misuse and misinterpretation certain comparisons which have been made in data published by the Department between changes in the average income per farm family and per factory employee. There are admittedly many controversial points involved in such matters—questions as to the items to be included on the income side and on the expense side; whether the food and other supplies produced and consumed on the farm should be valued at farm prices or at the prices which factory employees must pay for them in the city; the proper rental value of farm dwellings, and many others of a like kind to say nothing of the limitations placed upon most comparisons of this type by the lack of comparable data prior to 1919.

Obviously then, such comparisons, at best, can hardly represent more than the most general sort of approximation leaving considerable latitude for interpretation and possible error as well as for difference of opinion. We must not designate as "bias," however, what may

easily be honest difference of opinion as to the way in which certain of these rather difficult approximations should be made.

It may be that much of the difficulty in harmonizing various viewpoints can be avoided by recognizing that the agricultural situation of the past seven years cannot be adequately and fully defined in terms of an index of the purchasing power of farm products or of changes in the average returns of all types and kind of farmers. Helpful as the various indicators may be the fact remains that the problem is too complex and too varied as between different regions or in the same region at different times, to be measured with great precision by any one or all of these various measures of a general character which apply to the country as a whole.

Those responsible for the Department's index of the purchasing power of farm products in terms of non-agricultural commodities have never regarded it as a precise measure of the extent of the farmers' difficulties. Unquestionably it has been misused by many people. This misuse has been by no means entirely onesided. It is a matter of some interest that since the index has risen from a low point of 80 a year ago to 92 during recent months, many who have used the index for propaganda purposes are now beginning to realize its limitations as a measure of farm prosperity or adversity. This I believe indicates the difficulty which will always be encountered in attempting to obtain any precise measure of farm prosperity which will not be subject to misuse and misinterpretation by those who are so inclined.

Based upon eight years of constant contact with statistical workers in the Department and close association with many of those in our various state agricultural colleges I believe it can be fairly said that there is every disposition on the part of these workers to hew to the line of fact in a truly scientific spirit. I believe furthermore that so far as the scientific staff of the Department is concerned their work is just as free from political pressure as that of other institutions conducting research of a similar character. Political appointees come and go but the scientific bureaus are fairly permanent institutions and their personnel is fairly stable and safeguarded from political pressure to a very large extent by civil service regulations and in various other ways.

To be sure a large proportion of the members of the scientific staff of the Bureau and of the Department are farm reared and they have a real interest in and sympathy for agriculture. But interest in the subject of one's researches and a sympathetic approach to the study of farm problems are in no sense synonymous with bias. I recognize that the only interest of Dr. Davis is to improve the character of the basic statistical data for agriculture and to encourage independent and thor-

ough-going analysis of agricultural problems. I felt it only fair to my co-workers in the Department, however, to point out the incorrectness of the inference which has been suggested.

II

By Leon E. Truesdell

I wish to refer in particular to the comparisons which Dr. Davis has made between the census figures for crop acreage and production and the estimates of the Department of Agriculture covering the same items. Whatever may be said with regard to the figures for crops might also be said with regard to the figures for live stock and livestock products, making due allowance for the fact that it is more difficult to get accurate data for livestock products than for crops.

There is material out of which one might make a sharp controversy in the differences between the census figures for crops in 1924 and the uniformly (and in some cases considerably) larger estimates published by the Department of Agriculture. For these estimates in their present form were made after the census figures became available and their continued use implies that they are considered to be in the nature of corrections of the census data.

This is not the place nor the time for any controversy, but in justice to the census figures I feel that I ought to express very positively the opinion that many of the estimates are far too high. It is doubtless true that there was some under-enumeration in 1925—some farms missed entirely and some schedules from which crop acreages were omitted. I cannot believe, however, that the sum total of omissions of both types can have amounted to as much as 5 per cent in the case of any major crop, not to mention 10 or 15 or 40 per cent.

It is also true that duplication and other forms of overstatement get into reports of shipments and reports of stocks, and doubtless into some of the other data used to justify the use of production figures in excess of the census totals.

Further, it is worth while to consider what must be the situation with the figures for counties and smaller geographic areas if the United States total is assumed to be short as much as 10 per cent. It is fairly well known to those who have worked with actual enumerated data from large areas that the error will be concentrated in a few of the reporting units; in other words, 90 per cent or more of the reports will prove to be satisfactory under any kind of test or check-up, because they have been made by careful and competent men, and the remaining 10 per cent will be deserving of a rating somewhere between 100 per cent and zero—certainly not a flat rating of zero for the whole group.

But I must not take more time for details of this kind, as I wish to present a general principle which I think is much more profitable for our consideration here. I wish to stress in particular the radical and fundamental difference between a *census* and an *estimate* and above everything else to urge that these two should *never be mixed* or combined.

This does not preclude the use of the census as a basis or starting point for estimates for the intercensal years. In fact, such use of the census figures seems to me to represent the normal and proper relation between census data and estimates; and if it can be demonstrated that the current census figures are inadequate for the maintenance of this relation, then we ought by all means to make such improvement in the census figures that this relation, which was accepted throughout the early and relatively uncritical period of crop estimating, may be reëstablished.

The Census Bureau itself makes a few estimates in connection with the farm census, but these are simple and altogether mechanical in plan. For example, we estimate the egg production for farms reporting chickens on hand but not reporting eggs, by assuming a production of eggs equal to the average production per chicken shown for the farms with complete returns. I am not sure, however, but that we ought to omit even these estimates and confine our published data absolutely to tabulated figures.

The estimates made by the Department of Agriculture, in contrast with the simple estimates just referred to, are based on complicated series of data of diverse type and origin. These estimates form a necessary part of the current statistical material used by students of the agricultural situation, and I believe that they are being gradually improved year by year. I do not think, though, that they can ever be developed to such a point (as Dr. Davis almost implies) that they will take the place altogether of actual census enumerations. The sample that one would get by taking a dozen apples off the top of a barrel as it stands on display in the market would not very often represent fairly the whole contents of the barrel. And I still hold firmly to the opinion that statistical samples, as they are usually selected, have somewhat the same relation to the totals they are supposed to represent. The estimates of crop acreage and production are not based entirely on sample material, to be sure, but so long as they are based at all on samples it seems to me that they will be inclined to overstate the production.

A census consists theoretically of a direct count of the items required, made by a force of enumerators who cover the whole territory in person. In practice the returns for the farm census fall somewhat short of the theoretical ideal because of the difficulty of counting some of the things

that have to be counted. Crop acreage and production are relatively easy, but there are some items on the farm schedule with regard to which even the farmers who are doing the producing do not have accurate information. The most difficult of what we might term the standard questions is perhaps that relating to milk production.

In this connection I wish to make one urgent recommendation for the consideration of the consumers, and prospective consumers, of census data. I have had experience in connection with the last three censuses of agriculture and am firmly convinced that the results of the census would be worth more in the aggregate (not to mention the saving in expense) if the farm schedule were made even more simple, if not shorter, than that used in 1925. To make the schedule simple does not mean necessarily to reduce the number of questions printed on it, though I think that number might well be reduced below 200. It does mean the omission of all those questions which have given unsatisfactory results in the past and the positive refusal to add any new ones against which even a suspicion of possible lack of simplicity can be raised.

The remedy for the present imperfections of the farm census should be, it seems to me, to correct the causes of the imperfections rather than to try to *patch up the results.* We should rather try to find the immediate reasons for under-enumeration, if that is the main fault of the census, and seek to remedy the conditions.

The administration of the 1925 farm census was different from that of the immediately preceding decennial censuses in a number of respects. Without doubt it suffered far more than any other census has suffered from lack of adequate funds. In addition, new methods of administration were tried, some of which proved effective and efficient and some of which proved otherwise.

Further, the Census Bureau felt severely the lack of men trained in the technique of agriculture on its staff in 1925. We have to thank the Department of Agriculture for valuable assistance in the form of the temporary loan of some of their men; but what we needed were permanent additions to our own staff, for critical evaluation, for explanation of local terminology and practices, and for the interpretation of figures which nominally might represent either incomplete or excessive returns, or simply abnormal crop conditions in 1924.

In general, however, the taking of a census of the United States is a task requiring a vast amount of routine work, carried out consistently and conscientiously, through a volume of detail utterly unknown and unappreciated in any government office other than the Bureau of the Census. Such a task requires a few men of adequate training and wide

experience to formulate the schedules and instructions, to evaluate the returns as they come in, and to check up the tabulations as they are completed. It is more difficult, however, in the Census Bureau than in almost any other organization of comparable size, to recruit from the ranks the men required for these positions near the top, because the qualifications required along the way are not like the qualifications demanded of those in general charge of the work. And the routine work which bulks so large in the total program does not for long appeal to enterprising young men who would, with a few years of the right kind of experience, qualify for the non-routine positions.

The routine work has to be done, however, and it seems probable that if past censuses have been to any extent incomplete, their shortcomings have been due to the fact that the routine work has somewhere been slighted, rather than to the inadequacy of the general plan of the work. The task for those in charge of the next census is therefore that of getting the routine work done more completely and more accurately, rather than that of devising new methods of obtaining the final results or of adding any scheme for "adjusting" the tabulated totals.

Finally, let me speak of one new factor which I hope the Census Bureau will be able to introduce in the next census of agriculture and which I am sure will help more to make the results accurate than any other one thing (except the provision of adequate funds, which is presupposed), and that is the tabulation of the results in considerable detail by townships or similar minor civil divisions. With careful scrutiny of the results as tabulated for such small areas, both in Washington and by local men in each township, if the latter can be arranged for, it will be possible to discover promptly any shortage in the returns or any other serious error and to take the necessary steps to correct it either by reënumeration or by such other measures as may be found advisable. Further, this innovation will meet a growing demand for township data for actual use in connection with local studies and otherwise, and will help tremendously, I believe, in bringing the census figures home to the people whose agricultural activities they represent.

SOME DESIRABLE CHANGES IN THE FEDERAL CENSUS OF MANUFACTURES

By Woodlief Thomas

The American public can justly point with considerable pride to our census of manufactures. It is a distinctive institution. In the past no nation of the world has possessed such comprehensive and accurate statistics of its industrial organization and development. The first census of manufactures was made in 1810 and more or less fragmentary and unsatisfactory statistics of manufactures were obtained in 1820 and 1840, but the census of 1850 was the first to present fairly complete statistics of manufactures. During the remainder of the nineteenth century, censuses of manufactures were taken at decennial periods, covering the years 1849, 1859, and so on to 1899. These canvasses covered neighborhood, hand, and building industries, as well as factory industries. In the twentieth century the custom of taking a census of manufactures every five years was inaugurated and the canvass was limited to those establishments included in what is called the factory system. This limitation not only considerably reduced the burden of collection but also probably improved the accuracy of the figures because it defined somewhat more clearly the scope of the census statistics.

The Census Act of 1919 provided for a biennial census of "the products of manufacturing industries" and the first of these surveys covered the year 1921. Subsequent censuses were taken for 1923 and 1925 and the 1927 canvass is now beginning.

The salient features of the census reports are probably fairly familiar. I shall describe them briefly as they were under the quinquennial censuses and then discuss some of the important changes that have been made from time to time, especially when the system of biennial censuses was inaugurated.

In the first place the limitation of the census to establishments included in the so-called factory system, although somewhat more definite than earlier requirements, still leaves much room for differences of interpretation. The term "factory system" has been defined by the Bureau of the Census to include those establishments fabricating products for the general market. It excludes establishments with a total annual product valued at less than $500, those engaged primarily in custom-work and repairing or in the so-called neighborhood industries and hand-trades doing purely a local business, those engaged in

building construction, retail stores manufacturing incidentally on a small scale, and eleemosynary and like institutions engaged in manufacturing. Building construction is excluded and shipbuilding included; custom tailors are excluded but custom printers are included; automobile repairing was included until 1919, and has since been excluded. The industries included, however, remained comparatively fixed, and the quinquennial censuses of manufactures provided a comparable comprehensive set of statistics for four census years—1904, 1909, 1914, and 1919.

The schedules of inquiry call for information by industrial units rather than by financial or administrative units, and in general separate returns are received from each plant for which separate books of account are kept, although operating under a single ownership. Under the quinquennial censuses, information was requested concerning ownership and location of plant, character of industry, capital invested, persons engaged, salaries and wages paid, working hours, materials and supplies consumed, miscellaneous expenses, total value of product, value and quantity of certain individual products manufactured, and power equipment. In the published reports these data were presented in a variety of forms, giving complete information classified by industries, of which there were over 300, and by geographic divisions—states and cities and occasionally counties.

Although the law providing for the biennial census gave the Director of the Census broad limits in determining its scope, no radical changes were made in the general form of the canvass. There are, however, some important differences between the biennial and the former quinquennial censuses. The biennial canvasses have been limited to all establishments with annual products of over $5,000 in value, instead of over $500 as previously required. This reduced the number of establishments from which reports were received by over 20 per cent, while the number of wage earners and the value of products thus omitted were only about one-half of one per cent of the total formerly reported.

Of the other changes in the scope of the canvass instituted with the biennial census, perhaps the most striking is the expansion in the statistics of products that are being collected. Statistics showing the quantities and values of a larger number of individual products of factories are published in the current census reports than in those of earlier years. In this respect the scope of the census has been expanded and provides information of considerable value. On the other hand, a comparison of the single volume which includes all the published figures of the biennial censuses with the three volumes published to

cover the censuses for 1909, 1914, and 1919, and the four volumes for 1904, indicates that there has been some curtailment in the quantity of statistics published by the Census of Manufactures.

It is an interesting commentary that during the post-war period when there has been a rapid expansion in the use and appreciation of business statistics, our oldest and best established source of such statistics should have actually discontinued the publication of a number of important and significant series. It should be remembered, of course, that the Bureau has assumed the additional burden involved in collecting figures every two years instead of every five and that it was faced with the necessity of making its task fit its capacity as fixed by Congressional appropriation. The capacity might have been enlarged, as it was, for example, in one division of the Bureau, the *Survey of Current Business*, and in other divisions of the Federal Government providing other important statistical and trade services to commerce and industry. That phase of the subject, however, involves questions of budgets, economy campaigns, Congressional appropriations, pressure from influential interested individuals and organizations, and other aspects of the complicated technique of obtaining governmental action, that are perhaps beyond the scope of this paper.

It is of interest to note the type of information which has been cut from the census reports. In some cases inquiries have been removed from the schedules; in others detailed cross classifications of data available have been discontinued. Among the former are information as to character of ownership of establishments, statistics of capital invested, separation of wage earners data by sex, figures on number of children employed, earnings of employees classified by size of weekly earnings (included only for 1904), quantities and values of materials consumed by kinds, amounts and values of fuels consumed (other than coal), and miscellaneous information regarding other expenses such as rent, taxes, mill supplies, etc.

Information procurable from schedules but no longer tabulated or published relates chiefly to statistics of employees and to details by geographic units—for example, size of establishments on the basis of number of wage earners, hours of labor, complete figures for all industries within a state, and figures by counties. In addition, there have been omitted a large number of tables giving in convenient form for certain purposes data, which can now be obtained from the records as published only after considerable effort. In general it may be said that the items omitted from the schedule of inquiry, on which figures are reported by manufacturers, or from the published records of the census have been those for which there has apparently been the small-

est demand from outside sources or which were unusually difficult or expensive to collect or tabulate.

Statistics of products have been retained and expanded, although their collection and tabulation are difficult and laborious, because there has been an almost overwhelming demand from various sources for such information. With the recent growth in the use of business statistics by business men as well as by students of economic affairs there has been an expanding demand for statistics of actual quantities of specified products moving into the channels of trade. The wide fluctuations in prices during the last ten years have somewhat destroyed confidence in value figures as measures of volume of trade. The statistics of wage earners or of primary horsepower installed are in a sense indicative of industrial growth or of changes in the structure of industry, but their significance is limited, particularly at present, by the substitution of machinery and power for labor. Statistics of actual production are needed, in fact, in order to provide a measure of the extent of such substitutions.

There is another important advantage of quantity figures: Aggregates for individual products can be made of them without regard to the limitations imposed by the industrial classification which must be used for the other series. In the census classification an establishment making a number of products is assigned to the industry to which its most important product belongs. This means that if 51 per cent of a plant's output is fertilizer and 49 per cent soap, that plant is classified in the former industry, unless a separate report can be secured for each branch. It frequently is difficult to segregate power and workers and value added by manufacture among the different branches. Figures showing the actual production of fertilizer and of soap by all plants, however classified, on the other hand, can easily be obtained separately, and for many purposes are of more significance than the figures of output of only those plants classified in their respective industries.

Figures of materials consumed, which can be handled statistically in a similar manner to data on products, for some reason, have not been collected in the biennial censuses. This omission in my opinion is exceedingly unfortunate. Such data not only provide information regarding the movement of the important basic products of farms, forests, and mines into further production but also might be used to give some measure of the extent to which manufactured products are employed as materials in other stages of manufacture. Because of the duplication involved in the use of manufactured products in further production, the totals given by the census for value of products by groups of industries and occasionally by single industries lose a large

part of their significance. The duplication in the iron and steel industry alone is tremendous. Adequate statistics of manufactured materials consumed would give some means of correcting for this duplication. The statistics of value added by manufacture in part serve this purpose but they go a step too far and remove cost of raw materials as well as of partly manufactured materials. Thus no adequate measure of the actual value of output of an industry is procurable from the present census records.

In the census for 1904 figures were given showing:

Amounts paid for materials

Classified by kind:

Raw materials, partly manufactured, fuel, mill supplies, freight, and rent of power and heat.

Classified by source:

Farm, forest, mine, and sea.

Classification of industries according to relationships between costs of raw materials, partly manufactured materials, and other expenses, and wages and value of products.

Estimates of net value of product—allowing for consumption of partly manufactured materials.

Of more importance, perhaps, than these general statistics, which might involve considerable difficulty of definition in a number of cases, is specific information obtained for individual commodities and industries, where the situation is more clearly defined. For example, the extent to which silk and rayon are used in the making of cotton and woolen fabrics or the relative use of the various textile fibres in the production of knit goods would at present be useful information. These data in fact are being called for on the 1927 schedules. Such an inquiry is necessarily limited to those industries using simple basic materials, but in those cases the information provided is of considerable importance in indicating the various channels of consumption of important raw materials. In some instances such data provide rough measures of the physical volume of production.

Curtailment of statistics by geographic units on the part of the Census Bureau has been effected as an economy move in order to reduce the large amount of cross-tabulation involved in presenting such figures and to cut down on printing costs. In the quinquennial censuses one large volume of from 1500 to 2000 pages was devoted to statistics by geographic divisions; data by states were given in addition in the reports for separate industries. In the censuses of 1899 and 1919 county figures were given; and in the other quinquennial censuses

detailed information for the states and the larger cities was provided. In the 1923 census report only a little over 100 pages were devoted to figures by states and cities, giving only the most general statistics by industries. This particular curtailment has aroused considerable protest, owing to the growing utilization of statistics by localities in the study of markets and the desire of chambers of commerce and other local organizations for such figures to be used in community advertising and for similar purposes. Some localities have gone so far as to have special tabulations made at their own expense. This may provide a way around the economy difficulty but there are many enterprises which cannot afford such expense and which may be of sufficient worth to justify a small additional outlay by Congress for its official statistical bureau. The other procedure places private enterprises which happen to be able to pay for their information at an advantage over equally worthy enterprises less fortunate.

There has been a tendency in recent years to restrict the amount of statistics published by the census regarding workers engaged in manufacturing. Statistics of labor conditions are difficult to collect and to tabulate; manufacturers sometimes object to reporting certain items, such as sex and age of workers and wages by sex, and these data are in somewhat smaller demand than certain of the other items given by the census. Consequently in the biennial censuses no figures are collected as to number of wage earners or amount of wages paid by sex of worker nor are there any figures for workers under 16 years of age. Figures on size of establishment according to number of wage earners were not published for 1925 although this tabulation may be included in later censuses. This tendency is unfortunate. In the first place, such information is needed by students of labor conditions; and in the second place, a restriction of labor statistics might subject the Bureau of the Census to the criticism that it is being influenced more by the wishes of the employers than by the needs of other interests. The Bureau is dependent upon the factory owners and management for the information collected by the census, and as a practical matter it is much simpler to request only such information as the management wishes to report. This removes possible sources of conflict from the task of collecting the data, expedites the return of the schedules, and eliminates cause for reporting incorrect figures. It may yet remain a question, however, as to whether these considerations of expediency justify a governmental body in giving definite preference to the interests of a particular group.

In turning finally to a discussion of desirable changes which might be made in the Federal Census of Manufactures, it would seem, therefore,

that the first to be suggested would be the reinstatement of a large assortment of valuable statistics formerly presented but recently discontinued. A more careful appraisal of the situation, however, would not entirely justify such a conclusion. It must be remembered, in the first place, that the census is now taken every two years instead of every five years. This places a continuous burden on the staff of the Manufactures Division of the Bureau, for before the detailed publication of one survey is finished, work must begin in preparation for another. An enlargement of the staff would relieve this situation to a degree but most of the work is of such a nature that it cannot be hastened, as in any event it has to pass through a certain number of hands. Another factor to be considered is the questionable need of certain of this information as often as every two years, and a third element is the probable need of some of the manufactures census data more often than every two years and more promptly than they are provided. In view of these considerations, I am prepared to suggest a series of changes in the procedure of compiling the Federal censuses of manufactures which are both radical and reactionary.

The program is briefly as follows: There should be made annually a census of production and employment considerably narrower in scope than the present biennial census of manufactures, and quinquennially a census of manufactures somewhat broader in scope than the present biennial census—in other words, a return to the old scheme for a complete quinquennial census with, in addition, an annual census of limited scope. The plan is not new or original. It has been conceived by others interested in census procedure and has been discussed to some extent both publicly and privately.

In order to lighten the burden on the Census Bureau that an annual canvass would involve, the scope of the annual inquiry should be limited to those phases of manufacturing that are of especial significance for current purposes. In the first place schedules of inquiry should be sent only to those establishments with an annual product of over $20,000. It might be feasible to make the limit $100,000. The exclusion of establishments with products of less than $20,000 would cut down the number of reporting establishments from about 190,000 to about 130,000, a reduction of 30 per cent, while the number of wage earners would be reduced only 2 per cent and the value of product only 1 per cent. The $100,000 limit would reduce the number of establishments by about two-thirds, the number of wage earners by 10 per cent and the value of product by 7 per cent. A canvass of the 20,000 establishments with an annual product valued at over half a million dollars each would cover 70 per cent of the workers and nearly 80 per cent of

the product, providing a sample of industry as a whole, sufficiently large for many general purposes, but a $500,000, or even a $100,000, limit would distort commodity statistics for some specific industries.

SIZE OF ESTABLISHMENT BY VALUE OF PRODUCT—1925

Size of establishment	Establishments		Wage earners		Value of products	
	Number	Per cent	Number	Per cent	Amount (000 omitted)	Per cent
All classes	187,390	100.0	8,384,261	100.0	$62,713,714	100.0
$5,000 to $20,000	55,876	29.8	156,373	1.8	628,373	1.0
$20,000 to $100,000	68,951	36.8	660,309	7.9	3,272,197	5.2
$5,000 to $100,000	124,827	66.6	816,682	9.7	3,910,570	6.2
$100,000 to $500,000	42,209	22.5	1,675,911	20.0	9,576,090	15.3
$500,000 to $1,000,000	9,771	5.2	1,131,439	13.5	6,870,112	10.9
$1,000,000 and over	10,583	5.7	4,760,229	56.8	42,366,941	67.6
$500,000 and over	20,354	10.9	5,891,668	70.3	49,237,053	78.5

An arbitrary limitation of the canvass to large establishments would need to be made with care. In such industries as bread and bakery products, butter, cheese, and condensed milk, women's clothing, manufactured ice, lumber, and printing and publishing, the limit would probably need to be lower in order to obtain adequate representation.

This annual census would be devised to fit into the needs of those following current industrial developments. The feature of the census should be the prompt collection and publication of detailed statistics of quantities and values of products manufactured annually. Figures should be given for a large number of commodities and for several types and grades in order that they might be of use to those interested in individual markets as well as to students of general conditions. The Manufactures Division of the Bureau of the Census would coöperate, as they do now to a degree, with the other divisions of the Bureau collecting periodic current statistics from different industries. The collection of such data has expanded considerably in the past few years, and perhaps in a short time the inauguration of a comprehensive annual census would not be a difficult next step. In fact, in the biennial census the number of special industry schedules, *i. e.*, inquiries calling for detailed information regarding the products of individual industries, has been increased from less than 90 in the 1925 canvass to 153 in the forthcoming canvass for 1927. These 153 schedules cover 226 industries, or over two-thirds of the 330 industry classifications given by the census, and probably a considerably larger portion of products are now covered by these special schedules, which provide comprehensive biennial statistics of products.

In addition to information regarding products, it would be desirable to have data also for the more important basic materials used in manufacture. Such statistics would fit into the scheme of providing an annual measure of the flow of products through the channels of industry. These canvasses could be made, as they are now in a few instances, with the coöperation of the Bureau of Mines and the Department of Agriculture.

It would be highly desirable, although considerably more difficult, to include in this annual census monthly data on number of wage earners, as now collected in the biennial censuses. These figures, however, are difficult to collect and to tabulate as the reporting establishments must be assigned to the various industry classifications, and their inclusion might delay somewhat the publication of results. They provide, however, our only trustworthy measure of the volume of employment. A large and fairly representative sample of manufacturing establishments report monthly statistics of employment and wage payments to the Bureau of Labor Statistics, furnishing an indication of current trends and of industrial and geographical relationships, but these data, owing chiefly to the difficulty of securing reports from new firms until after they have passed through the stage of most rapid growth and the retention of firms which are in a state of decline, have a downward bias amounting to nearly 2 per cent a year. The indexes of employment of the Bureau of Labor Statistics and of the Federal Reserve Board, compiled from these data, indicated a decline in factory employment from 1923 to 1925 of 8 per cent, while that shown by census figures was only 4.4 per cent. Thus the best available current measure of factory employment showed a decrease during these two years about 300,000 larger than actually occurred. It is now possible to adjust these indexes by the use of census figures every two years, but owing to the time necessary to compile the figures, this check is somewhat delayed. At present, we shall not be able accurately to determine the trend of factory employment for 1926 and 1927 for about 18 months. An annual census of number of factory wage earners would provide such a check more promptly, and thus furnish an accurate measure of the volume of employment of the largest homogeneous group of income recipients in our social structure.

Some other figures would be highly desirable in this annual census. It would probably be a simple task to collect statistics of total annual wages paid along with number of wage earners. Such data would provide important and useful income statistics and would likewise serve as a check upon the monthly samples now collected by the Bureau of Labor Statistics. Statistics of inventories of materials and products

on hand would provide useful information for current studies of industrial conditions. There is a growing appreciation of the importance of adequate statistics of stocks on hand. They indicate the extent to which goods are moving through the channels of industry and trade, give some idea of the sources of demand for bank credit, and in other respects serve as important indexes in aiding the control of business fluctuations. Such data should be reported in the aggregate for all materials and products and in detail by quantity and value for those specific commodities for which production and consumption data are reported. This phase of the program also fits in with the activities of other divisions of the Bureau of the Census in regard to current statistics.

In addition to the omission of small establishments, the scope of this annual census might be further limited by reducing the number of industry classifications for which data are given. Industry classifications could be ignored in the census of individual products and materials, but they must be observed in the census of wage earners, and they would be of value for many purposes for products and materials. The Bureau of Labor Statistics has about 54 industry classifications in its monthly employment reports. A somewhat larger number would probably be needed for the more comprehensive canvass of the Census Bureau, but the list of about 330 could for annual purposes be considerably reduced by combination of like industries. This would diminish somewhat the expenses of collection and publication.

The new quinquennial censuses of manufactures under the suggested scheme should be in effect similar to the present biennial censuses with some few additions, largely reinstatements of data formerly given in the earlier quinquennial censuses. They provide thorough and comprehensive surveys of the manufacturing industries of the nation—giving detailed information by industries and geographic divisions as to character of organization, wage earners, wages, hours of labor, materials used, products, and power. Collection of statistics of materials and fuel consumed and of the sex of wage earners, dropped in the biennial censuses, should be resumed. Detailed figures on materials and products comparable with those given in the annual censuses should, of course, be published. It would probably be desirable to give certain general information by counties about every ten years at the time of the decennial census of population. Statistics of expenses, of capital invested, and of type of organization raise some difficult questions. These data have been considered difficult to collect and have been misused. Unless a carefully prepared schedule is presented they probably should not be published. Firms, however, should have more accurate information on these matters now than they did ten years ago, owing to

the necessity of filing income tax returns. On the other hand, with a small appropriation for statistical work to the Internal Revenue Bureau, these income tax returns could be tabulated and made to yield a valuable supply of information, obviating the necessity of collection of financial statistics in the census.

This program, as outlined, is not feasible with the present staff and appropriation of the Bureau of the Census. If the annual census is limited only to statistics of production, with perhaps a few important materials consumed, the task could be accomplished thoroughly and expeditiously. Statistics of wage earners, however, are difficult to collect and expensive to tabulate. Their inclusion would not only involve additional Congressional appropriation but would also delay the publication of the results. It is a fair question as to whether improved production statistics should be gained at the cost of less frequent employment statistics.

The full scheme presented is intended to be an ideal, within the realm of expediency, toward which efforts should be aimed. It would not be possible to put into effect until after the decennial census in 1930, although it would be desirable to make some provision for it in the law now before Congress. Information provided by the system, as outlined, would serve a large portion of the purposes for which business men, statesmen, and other students of economic and social conditions need industrial statistics. We now have annual statistics of the production of agricultural products, of minerals, and of forest products; and we have current data on imports and exports; but, although in recent years we have increased our supply of current statistics of manufactures, we do not possess comprehensive annual information regarding this phase of production. It is necessary to have an annual census of the products of manufacture in order that we may be able to secure an annual measure of the total volume of products produced and consumed by the nation as well as a current indicator of important shifts that are constantly occurring within the industrial structure. Annual statistics of employment and wages are needed to determine the state of consumers' purchasing power and to provide an index of the relation between output and workers for industry as a whole as well as for individual industries. Every five years a complete record of all phases of manufacturing industries would be provided, giving information regarding those elements which change more slowly. And every ten years with the additional information provided by the census of population, the census of distribution, which it is hoped will be inaugurated in 1930, and the censuses of agriculture and mining, an almost complete picture of the economic structure of the nation will be available.

THE CENSUS OF DISTRIBUTION

By Melvin T. Copeland

The Bureau of the Census is just concluding a task of interest to many statisticians. This task is a Census of Distribution in a group of selected cities. This census is of interest because of the facts which it reveals, because of the methods used, and because of the point of view which the undertaking represents.

The belatedness of the Federal Government in taking a Census of Distribution reflects the tardy recognition in all quarters of the importance of the study of marketing problems. Until recently little attention has been given to the making of scientific analyses of the economic and social questions pertaining to the distribution of commodities. Fifteen years ago there was no literature of consequence on the subject of marketing. Since that date some progress has been made, but there is still a dearth of basic information regarding marketing activities. In recent years rapid changes have been occurring in marketing methods; yet we have only a fragmentary record of these changes. The Census of Distribution, if it is a practicable undertaking, is an initial step toward giving us a far more comprehensive record of marketing developments than heretofore has been available.

A large segment of the population of the United States is engaged in marketing activities, and this group has a claim on the assistance of the Federal Government for the gathering of basic information which is fully as strong as the claims of the farmers and manufacturers. Farmers, manufacturers, and consumers, furthermore, are all deeply influenced by marketing activities. The prices which farmers receive for their products are affected by the smoothness and the effectiveness with which our marketing machinery works. The degree of activity of manufacturing plants and the regularity of the employment of those who work in those plants are governed largely by the sales of the companies operating the plants. The volume of sales, in turn, is influenced by the methods of distribution which are utilized, and improvements in methods of distribution can be effected expeditiously only when we have a comprehensive knowledge of the basic facts.

The mercantile firms engaged in the varied market activities of the country also need to have a better understanding of the conditions affecting their business and of the changes occurring. Students of marketing, finally, need a broad background for their scientific studies of marketing institutions and of the disposition of the national income.

A Census of Distribution, if it is a practicable undertaking, would be of especial aid to those business men and students who have occasion to make marketing analyses and studies of operating expenses. Such a census would assist materially in judging the significance of sample studies in the marketing field and in judging the applicability of samples taken in one section to conditions in other sections of the country.

The immediate influence which led to the taking of this Census of Distribution was the action of the National Distribution Conference, held by the Chamber of Commerce of the United States in 1925, which requested Secretary Hoover to appoint a committee on the Census of Distribution. The committee was appointed and as a result of its efforts and the stimulating interest of Secretary Hoover the Bureau of the Census was enabled to undertake the task. The initial step was to take a Census of Distribution in the city of Baltimore. Subsequently, similar censuses were taken in eleven other cities: Atlanta; Chicago; Denver; Fargo; Kansas City, Missouri; Kansas City, Kansas; Providence; San Francisco; Seattle; Springfield, Illinois; and Syracuse. The first results of the Census of Distribution in nine of these cities are now available.

The experiment which the Bureau of the Census has made in taking a Census of Distribution in these twelve cities shows that a national census is practicable. This experiment also furnishes a guide to some of the limitations of such a census, and to means of securing satisfactory results.

In the twelve cities in which the experimental census was taken, it was found possible to secure complete returns, and the results of the tabulations unquestionably are of significance to business men and to students of business problems. The reports show the volume of trade handled by various types of retail stores, the volume of sales per store, the numbers of persons employed, and various other data on retail trade as well as figures for wholesale trade.

As a test of the significance of the statistics obtained in this census, I have selected one series for illustration. From the data in the preliminary reports for nine cities, I have computed the average annual sales per person engaged in several selected retail trades.

In order to indicate the general significance of these figures I have calculated also the weighted average sales per person engaged in each trade for the nine cities as a whole and I have further computed the standard deviation from the weighted average. In computing the standard deviation I have used the ordinary formula $\sigma = \sqrt{\frac{\Sigma d^2}{n}}$.

AVERAGE ANNUAL SALES PER PERSON ENGAGED IN RETAIL STORES

	Automobile Accessories	Boot and Shoe	Department	Drug	Gasoline and Oil	Hardware
Atlanta	$10,340	$11,560	$8,180	$6,130	$6,160	$16,840
Baltimore	8,470	10,510	7,870	6 600	12,710	10,830
Chicago	9,150	9,810	9,760	7,370	11,380	10,960
Denver	9,180	10,160	6,670	6,880	11,510	7,630
Fargo	7,510	11,350	....	7,160	10,010	9,860
Kansas City, Mo.	8,770	14,010	6,950	7,940	9,980	8,390
Seattle	7,970	11,000	8,040	6,760	8,130	10,050
Springfield, Ill.	8,280	10,790	....	7,060	10,430	8,510
Syracuse	11,710	11,150	7,140	7,630	11,500	10,140

The average sales per person engaged in the retail shoe trade ranged from $9,810 in Chicago to $14,010 in Kansas City, Missouri. The weighted average for the nine cities was $10,400 and the standard deviation $1,131. In the automobile accessory trade the scope of the range was about the same as in the shoe trade, from $7,510 in Fargo to $11,710 in Syracuse, but the standard deviation, $718, was less than in the shoe trade. The weighted average for the automobile accessory trade was $9,120. Since the automobile accessory business is a comparatively young business, it is significant that there was not a greater dispersion of the figures for that trade than for the shoe trade.

In department stores the average annual sales per person engaged ranged from $6,670 in Denver to $9,760 in Chicago, the weighted average being $8,920, and the standard deviation $1,109. In the drug trade the range was from $6,130 in Atlanta to $7,940 in Kansas City, Missouri; the weighted average was $7,200, and the standard deviation $478. In the hardware trade the figures for Atlanta were far out of line with those for the other cities. The average for Atlanta in that trade was $16,840, whereas the next highest figure was $10,830, in Baltimore. The lowest figure for the hardware trade was shown by Denver, $7,630. The weighted average was $10,640 and the standard deviation $1,812. The high deviation figure was caused chiefly, of course, by the Atlanta report and, in view of the contrast between the hardware trade and the other trades covered by this test, I suspect that an error occurred in the Atlanta reports for the hardware trade.

For the retail gasoline and oil business the average annual sales per person engaged ranged from $6,160 in Atlanta, another error perhaps, to $12,710 in Baltimore. The weighted average for that trade was $10,-350, and the standard deviation $1,846, the large deviation in this case being caused primarily by the low figure for Atlanta. If the Atlanta figures for the hardware and gasoline trades were omitted, the standard deviation for the other eight cities become $1,052 for the hardware trade and $1,192 for the gasoline business, figures quite similar to

those for several other trades. This test, incidentally therefore, seems to me to furnish presumptive evidence of error in the Atlanta figures cited.

The fact that the figures for the gasoline and oil business were in general so similar to those for several other trades, such as the shoe business, seems to me to be significant. This helps to explain, I think, the development of the filling station business. Whereas some years ago the sale of gasoline and oil was handled largely by garages and stores selling primarily other types of merchandise, the increased use of gasoline and oil, resulting from the growth of automobile usage, has rendered it possible for a specialized trade to develop. It has become possible for a company to attain a volume of sales at a particular point large enough to permit economically the employment of men engaged solely in purveying gasoline and lubricants. With potential annual sales of only $3,000 or $4,000 per person engaged, specialized retail establishments were not economical, but with potential annual sales of $10,000, or thereabouts, per person engaged, full time employment could be provided economically for retailing the one group of commodities. This suggests a basic method of analysis, it seems to me, which can be applied to the study of the retail distribution of many other commodities.

The figures for the average annual sales per person engaged in certain trades in these cities are not greatly different from figures which have been obtained by the Harvard Bureau of Business Research. In 1922, for example, the computations of the Harvard Bureau showed a common figure of $11,900 for the average annual sales per person employed in 302 retail shoe stores located in numerous cities, as compared to a weighted average of $10,400 for the shoe stores in the nine cities for which complete returns have been published by the Bureau of the Census.

For 284 department stores with sales of less than $1,000,000 each, the Harvard Bureau figure for the average annual sales per person employed in 1926 was $8,500; for 163 department stores with sales for over $1,000,000 each, the typical figure was $7,900; whereas the census figures for department stores of all sizes in six cities ranged from $6,670 to $9,760 with a weighted average of $8,920.

Although no figures had been compiled previously, so far as I am aware, of the average annual sales per person engaged in the retail drug business, the low figures shown by these census computations go a long way in explaining the high operating expenses in drug stores, the fact of which has been established by a study of operating expenses.

This test of the data from the Census of Distribution indicates not only that the reports in most instances are dependable but that they will be useful for scientific study and for immediate practical utilization. The figures were gathered in nine cities, including small, medium, and large-size communities, in which conditions varied greatly. Nevertheless the variations, for the most part, were only such as can be accounted for readily by known causes and, with the exceptions pointed out, the standard deviations were no greater than was to be expected under such varying conditions. The standard deviation of the average annual sales per person engaged in the retail shoe trade was 10.9 per cent of the weighted average for that trade; for the automobile accessory business, 7.8 per cent; for department stores, 12.4 per cent; for drug stores, 6.6 per cent; for hardware stores (exclusive of Atlanta), 10.2 per cent; for gasoline and oil stations (also exclusive of Atlanta), 10.9 per cent.

These data from the Census of Distribution will be useful for numerous purposes of statistical analysis. They throw light upon some problems to which attention previously has been directed, and they also suggest opportunities for new and profitable inquiries. Why is it, for example, that the figures for several of the Denver trades were below those for other cities? What is the explanation for the large volume of sales per person engaged in shoe stores in Kansas City, Missouri?

From the business man's standpoint, the results of the census are of immediate practical value and to my knowledge already are being utilized by several companies in their studies of their own special problems. The figures to be derived from this census on the average annual sales per person engaged in a particular trade serve as an especially practical guide in retail store management. The deviation of the figures of an individual store from the average indicates the degree of efficiency in operation attained. Other figures are useful to manufacturers, for example, for comparison with the number of customers on their books, in order to show the relative density of their distribution. Thereby they can learn where to apply their efforts to best advantage.

The figures for wholesale trades, as published in the preliminary releases of the census do not have the same value as the retail figures. The wholesale trade figures are of value only for very general purposes, if at all. This is because of the duplication that has occurred in the tabulations. These figures include the sales by manufacturers' sales branches, manufacturers' agents, brokers, and wholesale merchants. When a broker, for example, sold canned goods to a wholesale grocer,

which the wholesaler resold to retailers, the figures for both sales were included in the wholesale figures. This defect in the figures is not inherent in the census itself and can be corrected in subsequent work. In calling attention to this defect, furthermore, no criticism is to be directed at the Bureau of the Census because the necessity of classifying various types of wholesale institutions was not brought to its attention at a sufficiently early date.

This reference to the necessity for classification of the figures for wholesale trade brings out one of the chief merits of having had the first Census of Distribution taken experimentally on a small scale. By taking this census in a small number of cities, it has been possible to uncover defects such as those in the classification of the figures for wholesale trade and to correct them before they have invalidated a census taken on a much more elaborate scale.

In further work of this sort I judge that some changes in the classification will be necessary. The greater divergency in the figures for the hardware trade than for some of the other trades may be attributed, it seems to me, to a failure to differentiate sufficiently between the hardware business and the machinery trade, the two of which should not be combined, if the most useful results are to be obtained. In further Censuses of Distribution, moreover, a somewhat clearer line of demarcation between industrial goods and consumers' goods also appears to be desirable.

DISCUSSION OF DR. COPELAND'S PAPER

By William J. Carson

Statistics of wholesale and retail trade recently collected and published by the Bureau of the Census, as has been pointed out by Professor Copeland, furnish excellent material in many respects for studies of the problems of distribution. For the specific cities included they provide, for example, valuable information as to the aggregate volume of business by lines of trade and by types of firms, and when the work is done on a national basis similar information for the country as a whole will be available.

At best, however, the census data will be available only for certain periods—once every five or ten years—and cannot be used to throw light on the course of trade from time to time. For current use information as to sales, stocks on hand, and other items from month to month is needed.

In order to provide such information the Federal Reserve Board and the Federal reserve banks have collected and published statistics of wholesale and retail trade for the past nine years. The data are reported by individual firms directly to the Federal reserve banks in most instances and are organized by the Federal Reserve Board for the country as a whole. They include the amount of sales made during the month, the volume of stocks on hand at the end of the month, accounts and bills receivable outstanding at the end of the month, and the amount of collections on accounts during the month.

Approximately 1,350 wholesale firms representing 18 different lines of trade and having annual sales of about $4,000,000,000 coöperate with the Federal reserve system in furnishing monthly statistics of dollar sales. These firms are located in about 350 cities, distributed throughout the United States. At the inauguration of the reporting service, efforts were made to obtain data only from the larger and more representative wholesale dealers in the various lines in different sections of the country that sell, for the most part, to retail stores. In many lines, however, it was found that manufacturers sell directly to retailers and effect distribution without the intervention of wholesalers, and in order to have these lines represented sales by the manufacturers were included among those reported to the Federal reserve system. The practice of direct selling by manufacturers to retailers varies widely in the several lines and even among firms in a particular line. It appears to be extensive in the meat-packing, agricultural machinery,

shoe, and furniture industries, and it is for these lines particularly that statistics of sales are furnished to the reserve system by manufacturers.

Statistics of retail trade for the country as a whole are furnished by department stores, mail order houses, and chains of stores. Annual sales of these stores amount to approximately $4,500,000,000. Sales of department stores are reported by about 550 firms located in 225 cities and amount to slightly more than $2,000,000,000 annually. Statistics of mail order house sales are furnished by four leading firms with yearly sales of approximately $525,000,000. Reports of sales of chain stores include 86 separate chains operating over 33,000 stores throughout the United States and having annual sales of nearly $2,000,000,000. They include firms handling groceries, five-and-ten-cent variety merchandise, wearing apparel, shoes, drugs, cigars, candy, and musical instruments. In addition to these statistics of department stores, mail order houses, and chain stores, which cover the country as a whole, reports by stores specializing in men's and women's wearing apparel, shoes, and furniture, are furnished in some sections of the country, but the amount of sales of the reporting firms in these lines is not large.

Department stores furnish to the reserve system statistics of sales, stocks, accounts receivable, and collections, but sales only are reported by all firms. Statistics of sales and the number of stores operated are furnished by chain stores, and statistics of sales only are reported by mail order houses.

In addition to total sales and stocks, department stores in the larger cities in nine Federal reserve districts also report sales and stocks of merchandise by separate departments. These data were first furnished in 1923 by stores in two Federal reserve districts, but since that time firms in other districts have begun to furnish similar data. Up until the present time data have been furnished for 45 separate departments, but variations in the departmental organization of different firms have impaired the comparability of the data and in the future the reports covering the country as a whole will be limited to about 33 departments. In several of the Federal reserve districts where the departmental organization does not differ very widely between firms, data will be collected and published for a somewhat larger number of departments.

Lack of satisfactory information regarding the total volume of wholesale trade makes it impossible to ascertain with any degree of certainty the proportion of total wholesale sales that is represented by the firms reporting to the Federal reserve system. For the nine lines—groceries, meats, dry goods, men's clothing, women's clothing, shoes, hardware, drugs, and furniture—used in the Board's new index of wholesale distribution it is believed that the reported sales give a sample

sufficiently large to reflect fairly well the changes in the total amount of wholesale distribution in these lines, when compared with the estimated manufactured value of the merchandise sold. The firms reporting are either distributed throughout the country or are concentrated in sections where lines of wholesale trade are particularly important, so that they are representative of their respective branches of the wholesale industry. In each of these lines there is a considerable number of reporting firms with a substantial volume of sales when all reporting firms are considered. From one Federal reserve district to another, however, there is considerable variation in the relative importance of the lines represented, as well as the extent to which the reporting firms are properly representative of their respective lines, and inter-district comparisons can be made only in a general way.

As in the case of wholesale firms, complete information as to the annual volume of retail trade in the United States is not available and it is impossible to ascertain accurately the proportion of total sales that is represented by the data reported to the Federal reserve system. It has been estimated, however, by Mr. Lawrence B. Mann [1] and Mr. Paul H. Nystrom [2] that total retail sales amount to between 35 and 40 billion dollars annually and on the basis of these figures, sales of the firms reporting to the Federal reserve system, which amount to 4½ billion dollars annually, represent from 10 to 13 per cent of total sales of all retail firms. Accurate information as to the proportion of total sales that is made by different classes of retail stores is likewise unavailable and the proportion of total sales of the different classes of stores that is represented by the data reported to the Federal reserve system is not known. On the basis of data, however, that have become available for several individual cities mentioned by Professor Copeland, it is possible to compare the volume of sales of department stores reporting to the Federal reserve system with total sales of all department stores in these cities. In Seattle, Baltimore, and Kansas City stores reporting to the Federal reserve banks make from 80 to 90 per cent of the total sales of all department stores in those cities, and in Atlanta and Denver sales of reporting firms amount to about two-thirds of the total. In Chicago the representation is less complete than in these cities, but in the other larger cities of the country including New York, Boston, Detroit, San Francisco, etc., reporting stores include practically all of the larger firms.

The confidential nature of the data has made it impossible to publish the statistics in actual dollar amounts by cities. In presenting the results of the data to the coöperating firms as well as to the public,

[1] *American Economic Review*, December, 1923. [2] *Harvard Business Review*, January, 1925.

the Board and banks have used percentages and index numbers to express the changes that occurred in the current month as compared with an earlier period. The Federal reserve banks publish the data by individual cities within the district and for the district, and the Federal Reserve Board publishes the aggregate results of the data for the country as a whole and by districts.

In publishing the data for the country as a whole, the Federal Reserve Board has constructed index numbers of wholesale trade, department store sales, department store stocks, and chain store sales. Up until the present time the indexes have been based on average sales in 1919 as 100, but the indexes are now being revised to a more recent base period (1923–1925 = 100) and to include many additional firms which in recent years have begun to coöperate with the reserve system and furnish data regularly to the reserve banks. The new index of wholesale distribution is published in the *Federal Reserve Bulletin* of December, 1927, and revised indexes of retail sales and stocks will be published in the immediate future.

In these statistics of wholesale and retail trade, which are incomplete and inadequate for many purposes, considerable information is available relating to the course of merchandise distribution. The data are useful in connection with studies of conditions in industry and trade and throw light on the extent to which the country's output of industry is passing through the channels of distribution. Experience gained from the use of the data in connection with Federal reserve policy during recent years shows a close relation between changes in the course of retail sales from month to month and from season to season, and the amount of money in circulation, and indicates that changes in the amount of inventories carried by retail and wholesale firms frequently explain, in part, changes in the demand for bank credit.

The data also furnish valuable information as to the variations in the amount of sales from month to month and from season to season. This is particularly important to manufacturers in certain lines whose output is characterized by heavy demands at certain seasons of the year in so far as it enables them to adjust their operations to meet the demand without unnecessary strain at the peak periods. In the men's clothing industry, for example, one of the lines included in the index of wholesale distribution, the data show that sales are heaviest in two seasons of the year—first, in March and April, and secondly in August, September and October. The data also show that department store sales fluctuate widely during the year, reaching a high point in the spring—March or April—and a peak in the fall, particularly in Decem-

ber, when approximately 14 per cent of total department store sales for the year are made. In the case of an individual firm, the data are very useful in furnishing a basis on which to compare its own operations with the operations of all stores in the city where it is located or in a given section of the country.

POST-WAR PRICES AND PRE-WAR TRENDS[1]

By Frederick C. Mills

In attempting to define the economic characteristics of a period extending over a number of years interest centers not in the short-term economic movements—cyclical or accidental in character—which command contemporary attention, but in enduring conditions and sustained tendencies. It is these which reflect those more stable influences and those long-term changes in economic relations and in the location of economic power which are significant from a longer view. Among the most important of the elements to be studied in such an analysis of an economic era are price factors. Tendencies in price behavior and changing relations among commodity prices have an immediate and obvious bearing upon general economic developments.

A clearly defined economic era ended in the year 1914, with the out-break of the World War. The disturbed years from 1915 to 1921 constituted a period of transition. By the end of 1921 the most severe of these disturbances were over, and I think we may say that 1922 marked the beginning of a new era. The length of this era, the degree of homogeneity it may possess when seen in retrospect, the tendencies which will give to it its distinctive complexion, and the degree to which it will resemble the last pre-war period—these are questions for the future to answer. This post-war period is altogether too brief to justify any definite conclusions concerning conditions which will endure or trends which will prevail. But records for the six years which have now been run throw some light on present conditions and future expectations, and the interest attaching to this period justifies some attempt to define its characteristics. The story may be somewhat more illuminating if these post-war movements be contrasted with the tendencies which prevailed during the several decades preceding the War.

I

Among the conditions and tendencies in the field of prices which gave to the period extending from the early or middle nineties to the outbreak of the War its distinguishing economic characteristics the following were of major importance.[2]

[1] Some of the materials and conclusions given in this paper appear in *The Behavior of Prices*, a publication of the National Bureau of Economic Research. Detailed descriptions of the relevant data and explanations of the procedure will be found in that volume. The paper contains, in addition, certain preliminary results of investigations now under way.

[2] These were not necessarily causal factors. Certain of the price conditions noted may merely have reflected other economic conditions.

1. A rising price level.
2. A considerable degree of internal disturbance in price relations, a degree of disturbance which tended to decline.
3. Relatively high variability of prices of individual commodities, marked again by a tendency to decline.
4. The existence, between 1896 and 1913, of clearly defined trends in the prices of most commodities at wholesale and in certain prices in other fields, trends which differed materially as among different elements in the price system.

The rising tendency in the level of prices during the two decades prior to the War, a tendency shared by every important commodity group in the United States, provided one of the most fundamental of the conditions under which business men of that era worked. It affected manufacturing methods and buying and selling habits, and was reflected in numerous business practices which business men found hard to change when conditions were altered. But the economic consequences of a rising price level have been discussed in considerable detail, and require no elaboration here.

But the general price index does not tell the whole story of the price movements of this period. Such an index measures the intensity of the force, or combination of forces, which is affecting the purchasing power of the dollar. But there is a host of specific price-making forces which affect, primarily, the prices of individual commodities. These forces operate to change individual commodity prices unequally, and to prevent the prices of individual commodities from accommodating themselves promptly to changes in the purchasing power of the dollar. The influence of these disruptive forces is reflected in the dispersion of prices. The less direct the incidence of the force which is acting upon the price level, and the greater the relative importance of specific price-making factors, the more widely dispersed will prices be. These disruptive forces possess considerable economic significance, for every inequality of movement affects the buying and selling relations upon which the movement of goods depends. Every inequality of movement introduces some element of instability into the price system.

The index employed in measuring the dispersion of prices defines, in percentage form, the approximate limits of the zone within which would fall 50 per cent of the price relatives at a given date, and on a given base.[1] Thus a value of 10 for a given date means that, on that date, approximately half the price relatives deviated from the geo-

[1] This measure is the antilogarithm of a fractional part (.6745) of the logarithmic standard deviation. The logarithmic standard deviation was first used as a measure of dispersion by Professor Irving Fisher.

metric mean of all the relatives by less than 10 per cent. Such measures, computed from annual link relatives, weighted, for the period 1891–1926, are given in Table I, together with geometric means of the

TABLE I

GEOMETRIC MEANS AND INDEXES OF DISPERSION COMPUTED FROM WEIGHTED LOGARITHMS OF LINK RELATIVES OF WHOLESALE PRICES, 1891–1926

(1) Year	(2) Number of price series	(3) Geometric mean	(4) Index of dispersion
1891	195	100.0	10.6
1892	195	93.8	7.3
1893	195	101.8	8.3
1894	195	89.8	7.9
1895	195	101.3	9.8
1896	195	95.3	9.8
1897	195	100.6	9.7
1898	195	102.6	7.7
1899	195	107.1	10.5
1900	195	108.5	8.4
1901	195	99.2	7.9
1902	195	107.3	8.6
1903	205	100.8	9.2
1904	205	99.6	10.2
1905	205	100.6	7.4
1906	205	103.6	7.7
1907	205	106.4	5.7
1908	205	96.0	8.7
1909	205	106.1	7.6
1910	205	102.9	7.9
1911	205	94.5	8.7
1912	205	106.8	7.3
1913	205	101.1	8.4
1914	391	97.9	7.4
1915	391	101.1	10.6
1916	391	125.8	13.7
1917	391	138.6	12.4
1918	389	111.7	14.2
1919	389	106.8	11.9
1920	391	110.2	15.7
1921	391	65.4	18.3
1922	391	101.0	11.7
1923	390	105.0	11.0
1924	390	97.4	8.3
1925	387	105.8	11.5
1926	385	94.5	8.9

link relatives. The measures of dispersion and the geometric means chained on the 1891 base are plotted in Figure 1.[1]

Two facts concerning these measures are of immediate significance. The first is that this pre-war period, particularly the first part of the period, was marked by a relatively high degree of dispersion, that is, by relatively severe disturbances in price relations.[2] The second point

[1] The commodities employed are those for which wholesale price quotations are published by the United States Bureau of Labor Statistics. The weights are based upon the values of the quantities marketed during the period 1920–1923.

[2] Severe, that is, relative to similar disturbances at other times and in other lands. That it was severe during the early part of this period in comparison with disturbances in other periods is shown by certain measures, not given above, defining the degree of dispersion of fixed base relatives in different periods. The dispersion, in 1902, of relatives on the 1891 base is measured by an index of 17.6; in 1913 the index of dispersion of relatives on the 1902 base was 14.1; in 1926 the index of dispersion of relatives

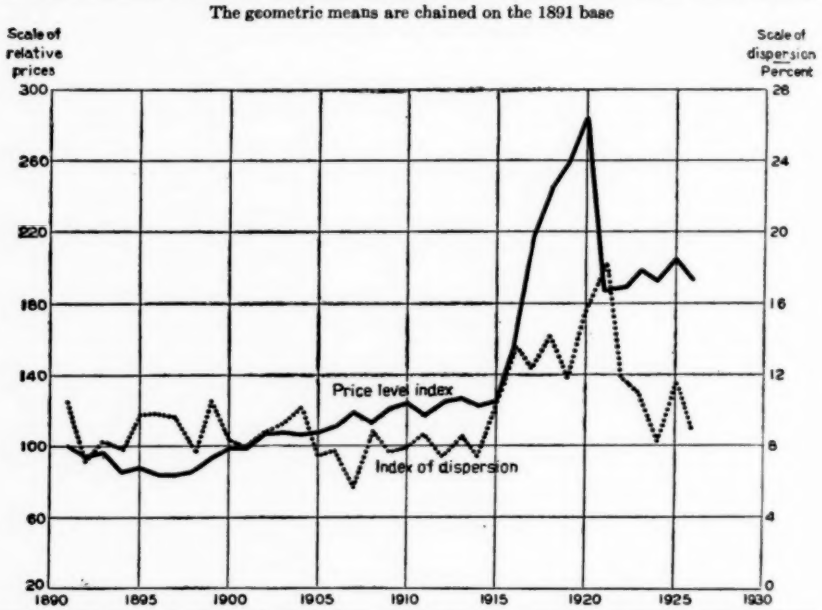
of importance is that during the 24 years prior to the War there was a sustained downward tendency in the degree of dispersion of link relatives. The disturbances of which such dispersion is a reflection

FIGURE 1

INDEX NUMBERS MEASURING CHANGES IN THE LEVEL OF WHOLESALE PRICES AND IN PRICE DISPERSION, 1891–1926

WEIGHTED GEOMETRIC MEANS AND INDEXES OF DISPERSION COMPUTED FROM ANNUAL LINK RELATIVES

The geometric means are chained on the 1891 base



on the 1913 base was 17.4. (The figures for intermediate years of this last period were considerably higher, but at the end of the period the dispersion was less than it was in 1902, on the 1891 base.)

That the disturbance was severe in comparison with similar disturbances in other lands is suggested by certain figures of Lucien March (*Metron*, Vol. 1, No. 4, p. 83). Using relatives on the 1890–99 base in each case, March gives the following figures:

Number of commodities		Standard deviation of price relatives
203	United States, in 1909	31.8
55	France, in 1913	22.5
42	Great Britain, in 1913	20.0

Although the period was four years longer for France and Great Britain than for the United States (a fact which would tend to increase the dispersion) the degree of dispersion was materially greater in the United States than in either of these countries. Differences in the commodities used, and in the number of quotations employed, lessen the comparability of the results, but the same general tendencies would probably be revealed by other samples.

Both these examples relate, not to year-to-year dispersion of the type referred to in the text, but to the dispersion of prices over much longer periods. The records of the war years support the reasonable assumption that exceptional disturbance of fixed base relatives will be associated with high dispersion of link relatives.

were definitely diminishing. I shall discuss the economic significance of these facts in connection with the next point considered.

The third important characteristic of pre-war price behavior is the high variability of the prices of individual commodities. Such variability may not be registered at all in changes in the price level. Though price level changes and the variability of individual prices are not unrelated, the one furnishes no accurate index of the other. For each of more than 200 commodities we have, for each year from 1890 to 1926, a measure of the variability of its prices within the year.[1] The averages of these annual measures are given in Table II, and are shown graphically in Figure 2.

TABLE II

MONTHLY VARIABILITY OF WHOLESALE PRICES—AVERAGES COMPUTED FROM MEASURES OF PRICE VARIABILITY FOR INDIVIDUAL COMMODITIES, 1890–1926

(1) Year	(2) Number of price series	(3) Arithmetic mean of measures of variability
1890	204	4.8
1891	204	4.4
1892	204	4.5
1893	206	4.9
1894	206	4.6
1895	206	6.3
1896	206	4.7
1897	206	4.8
1898	206	4.1
1899	206	6.0
1900	206	5.5
1901	205	4.3
1902	214	4.7
1903	214	4.8
1904	214	4.1
1905	214	4.5
1906	214	3.5
1907	214	4.5
1908	214	4.7
1909	214	4.6
1910	214	4.3
1911	214	4.3
1912	214	4.6
1913	213	3.7
1914	214	4.4
1915	214	5.9
1916	214	8.7
1917	214	10.6
1918	213	7.3
1919	212	9.7
1920	214	10.8
1921	214	8.5
1922	213	6.5
1923	214	4.9
1924	213	5.4
1925	211	4.7
1926	211	4.2

The points noted in connection with the dispersion of prices appear to be true of these measures of price variability. The wholesale prices of individual commodities in the United States during this period,

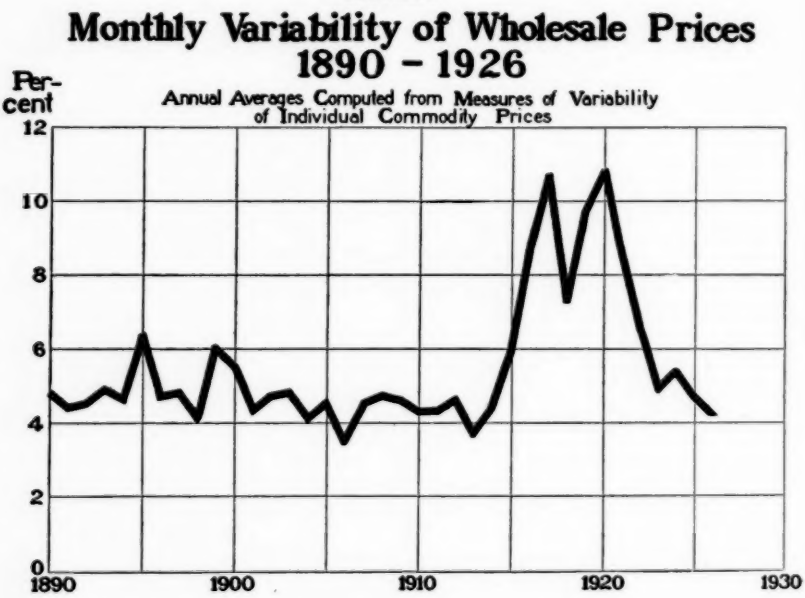
[1] This measure is the mean deviation, expressed as a percentage of the mean price for the year.

as a whole, were highly variable;[1] this variability was tending to decline.

A consideration of these measures of dispersion and of price variability throws some light on the economic characteristics of the pre-war period.

1. The prices of individual commodities were subject to relatively abrupt changes from month to month and from year to year. (There

FIGURE 2



were, of course, many individual exceptions to this general condition.) These changes introduced a considerable degree of uncertainty into business operations, and enhanced the speculative features of business operations.

2. The relatively high degree of dispersion from year to year represents a condition of rapidly changing price relations. The specific

[1] We have, unfortunately, no similar set of averages for other countries covering this period, but some indication of the relative variability of American prices and prices in other countries is afforded by a comparison of measures of variability relating to individual commodities. In 24 out of 31 such comparisons of individual price series in the United States and in other countries (Great Britain, France and Germany) American prices were found to be more variable. Again, measures of price variability for seven important commodities (coal, iron, sugar, silk, rice, barley and wheat) in five countries for the period 1890–1913 were averaged. The average was highest for the United States, with Japan, France, Great Britain and Germany coming next in order. These are only scattered cases, yet they indicate that our pre-war price system was characterized by a relatively high degree of variability of individual commodity prices.

price-making forces which affected individual commodities differed materially in their intensity; the disruptive forces which tended to alter existing price relations were relatively strong. Here, again, we have a condition which introduces uncertainty into business dealings, and intensifies the speculative element in business dealings.[1]

3. The preceding points may be summed up in the statement that there was a relatively high degree of price instability in the pre-war era. Individual prices and the relations among the prices of individual commodities were both relatively unstable.

4. Finally, and perhaps most important, during the quarter century preceding the War these measures of instability showed a definite tendency to decline. The variability of individual commodity prices was diminishing, and there was less disturbance in price relations. The movement toward greater stability of individual prices and of price relations was broken and uneven, but it is clearly present as a sustained trend.[2] This downward trend is the more significant in that it accompanied a rising price level.

In the high variability of individual prices prior to the War, and in all that that implies, we have, I think, one of the most significant of the conditions which gave to pre-war economic life its characteristic tone, and in the downward trend of this variability we have one of the most important of the tendencies which marked the economic development of this period. The conditions of high price variability and marked disturbance in price relations offer opportunities to business men for those conjunctural profits which result from faulty economic adjustments and temporary dislocations. A rising price level, coupled with variable individual prices, represents a very happy hunting ground indeed for the speculative elements in the business world.[3]

The final subject to consider in discussing pre-war price tendencies in the United States relates to the long-term shifts in internal relations which were taking place during this period, to those enduring changes which result from differences in the long-time trends of the prices of individual commodities.

A single illustration, afforded by the data plotted in Figure 3 may make the argument clearer. There are here shown the wholesale prices of four commodities, reduced to relatives on the 1896 base,

[1] Points 1 and 2 represent different aspects of essentially the same phenomena. The first depicts the condition with reference to the behavior of individual commodities; the second involves the relations among commodity prices, and the degree of difference in their changes.

[2] This trend is apparent not only in the two sets of measures given above, but also in certain measures of the frequency of changes in the prices of individual commodities which, because of time limitations, cannot be here discussed.

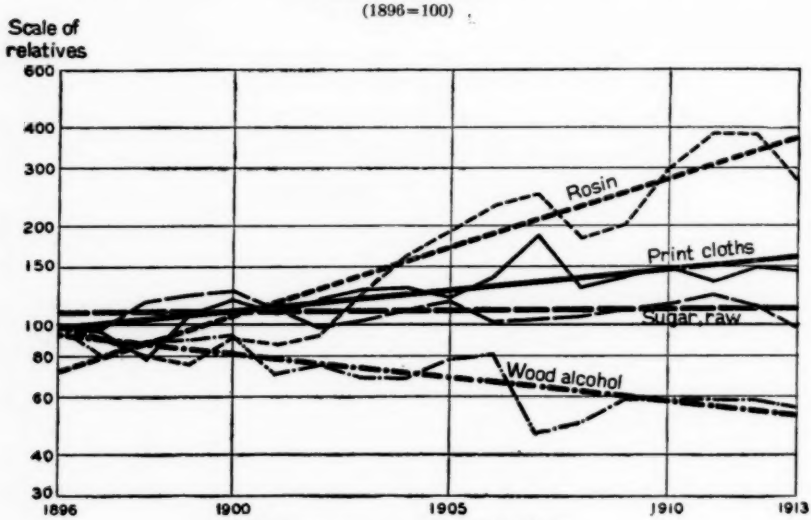
[3] There is, it is true, a dark side to the picture, for highly variable prices will present opportunities for conjunctural losses, as well as for profits.

together with lines of trend fitted to the price relatives. (The lines of trend are straight lines on ratio paper, so that the slopes of these lines represent constant percentage rates of change.) During this period rosin increased in price at an average rate of 10.19 per cent a year, raw sugar at a rate of .06 per cent a year, while wood alcohol decreased in price at an average rate of 3.4 per cent a year. These were sustained movements, persisting throughout the period covered, although overlaid at times by short-term upward and downward

FIGURE 3

RELATIVE PRICES OF FOUR COMMODITIES, AT WHOLESALE, 1896–1913, WITH LINES OF TREND*

(1896=100)



*Sugar, raw: $y=109.3\ (1.0066)^x$
Print cloths: $y=98.6\ (1.0285)^x$
Rosin: $y=71.5\ (1.1019)^x$
Wood alcohol: $y=94.4\ (.9663)^x$
(origin: 1896)

swings. Between the limits of +10.19 per cent for rosin, and −3.4 per cent for wood alcohol fall all the measures relating to the trend movements of the wholesale price series quoted by the Bureau of Labor Statistics. The individual figures are not of interest to us at the moment, but the fact of these enduring differences in trends is of considerable economic significance. These differences result, presumably, from differences in extractive or manufacturing conditions, or from differences in demand. They represent shifting economic relations—changes in the relative positions of different groups of producers. And these are lasting shifts, not the temporary shifts which occur during single periods of depression and prosperity. Those

commodities and groups which are increasing in price at rates above that of the general index are increasing in per unit purchasing power in the wholesale markets. Those which are declining, or which are increasing in price at a rate below that of the general index, are declining in per unit purchasing power.

It has been suggested above that certain types of price behavior help to determine the economic complexion of an era. I would now add that some of the fundamental economic characteristics of a period are determined by long-term shifts in price relations which are taking place as a result of differences in price trends of the type illustrated above. These differences, and their economic significance, may be best appreciated when attention is shifted from individual commodities to important commodity groups. The time at my disposal will permit of only a brief comparison of the measures for different groups.

TABLE III

PRE-WAR TRENDS—AVERAGE ANNUAL RATES OF INCREASE IN CERTAIN INDEX NUMBERS OF PRICES AND EARNINGS, 1896–1913

Index	Average annual rate of increase
All commodities, wholesale (U. S. B. of L. S.)	2.35
Farm products, wholesale	3.38
Foods, wholesale	2.32
Cloths and clothing, wholesale	1.79
Fuel and lighting, wholesale	2.07
Metals and metal products, wholesale	.85
Building materials, wholesale	2.45
Chemicals and drugs, wholesale	.47
House-furnishings, wholesale	1.39
Miscellaneous, wholesale	1.51
Agricultural products, wholesale	2.86
Non-agricultural products, wholesale	1.86
Purchasing power of agricultural products in terms of non-agricultural	.98
Raw materials, wholesale	3.02
Producers' goods, wholesale	.97
Consumers' goods, wholesale	2.32
Producers' goods, industrial products, wholesale	.94
Consumers' goods, industrial products, wholesale	1.84
Raw materials (27)	3.01
Manufactured goods (70)	2.03
Earnings, all groups (Douglas)	2.43
Earnings, manufacturing group (Douglas)	2.01
Cost of living (Douglas)	1.93
Purchasing power of earnings, all groups	.49
Purchasing power of earnings, manufacturing	.08
All commodities, Great Britain (Sauerbeck)	1.66
All foods	1.17
Vegetable food	1.29
Animal food	1.37
Sugar, coffee, tea	.46
Total materials	2.01
Minerals	2.03
Textiles	2.34
Sundry materials	1.68
All commodities, Germany (Statistisches Amt.)	1.77
Foodstuffs	1.90
Raw materials	1.76
Hides and leather	2.73
Textiles (1)	2.52
Textiles (2)	2.64
Metals and petroleum	1.94
Coal and iron	1.22

The average annual rates of increase in the prices of commodities falling in certain basic groups are summarized in Table III. Most of the index numbers on which they are based are available in published sources. Certain indexes which have been computed in connection with the present study will be published at a later date.

In order that the comparison of rates of change may be the clearer, lines representing these trends are shown in Figures 4 and 5. The original index numbers have not been plotted on these charts.[1]

From 1896 to 1913 the general level of wholesale prices in the United States was increasing at an average annual rate of 2.35 per cent each year. But this rate was not constant for all commodity groups, and it is these differences in the rates of change which now concern us. Certain of the most significant of these differences are emphasized in the graphs depicting these trends. I shall merely summarize the evidence which the figures and the graphs present.

During the two decades before the War prices of the products of American farms, at wholesale, were increasing at a rate which exceeded that of non-agricultural products by about 1 per cent each year. That is, the purchasing power of agricultural products, in terms of non-agricultural products, at wholesale, was increasing at the rate of 1 per cent a year.[2] The fact that the rate of increase in the prices of agricultural products exceeded the rate of change in non-agricultural prices was of salient importance in giving to the pre-war era certain of its distinctive economic characteristics.

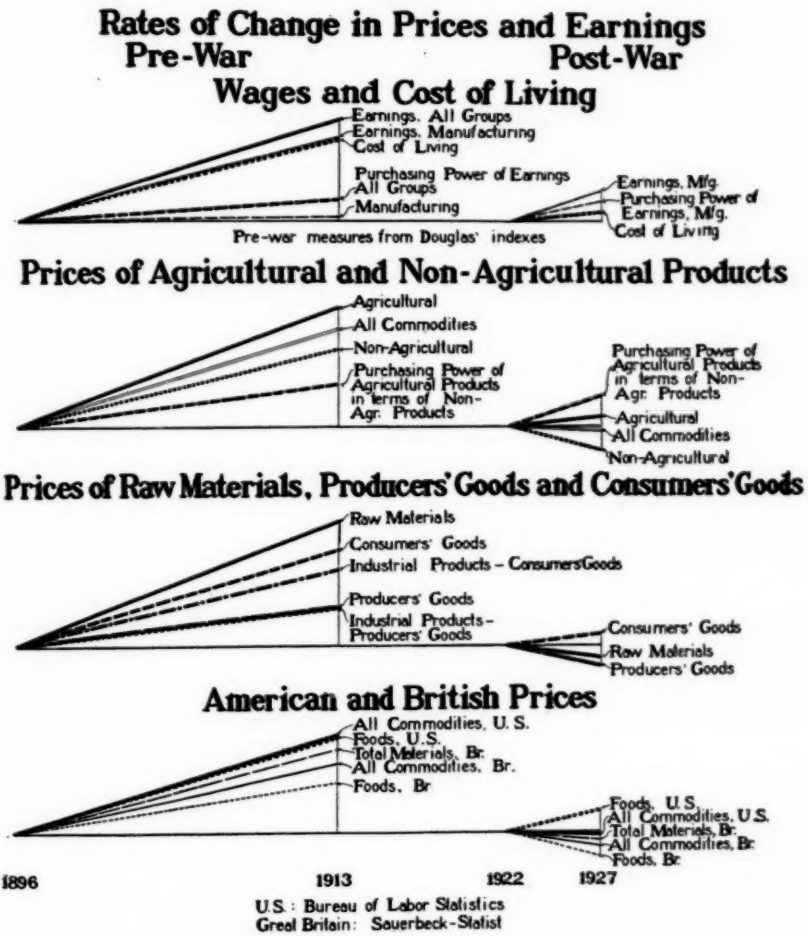
Among the most important of the differences between the trends of basic economic series in pre-war years were those relating to the prices of raw materials, producers' goods and consumers' goods. Raw materials rose in price during this period at an average annual rate of 3.02 per cent each year. (Of the four constituent groups making up all raw materials, the sharpest advances occurred in the prices of forest products, 4.13 per cent; smallest advances were in the prices of raw mineral products, 2.05 per cent. Raw farm products, 3.73, and animal products, 3.05, fell between these limits.) Producers' goods increased at slightly less than 1 per cent a year, and consumers' goods increased

[1] The question of whether these lines truly represent the trends of the various index numbers is, of course, relevant, but "goodness of fit" in the statistical sense is not so important in this case as it is when lines of trend are used as bases from which cyclical and other deviations are to be measured. What is required for the present purpose is a measure of the average rate of change during this period, and it seems appropriate to evaluate this change in terms of such a trend. (In fitting these lines use has been made of Glover's mean value table, given in *Tables of Applied Mathematics*, p. 468.) In fact, however, the fits secured by this procedure for the particular periods covered are generally satisfactory, even when stricter standards than those which seem necessary in the present case are applied.

[2] The rate of increase in purchasing power is secured by dividing the rate of increase in the prices of agricultural products (the r of the equation $y = ar^x$ being expressed in full) by the rate of increase in the prices of non-agricultural products. The desired rate, in the present instance, is given by 1.0286/1.0186.

at a rate of 2.32 per cent. I should judge that the relation here revealed between the rates of change in the prices of raw materials and of all commodities is that which would normally prevail in a country with an established industrial system, and in a newer country as well, once the

FIGURE 4



first rush of exploiting natural resources was over. (We find the same relation between materials and all commodities in Great Britain.) Raw materials, per unit, become dearer in terms of other commodities.

The relations between the rates of change in these three broad groups present several interesting problems. That producers' goods rose so much less rapidly than raw materials is doubtless attributable

in part to an increase in the difficulties of extracting raw materials and to an extension of agricultural activities to less productive soils, and in part to the relative cheapening of finished goods with large scale productions and with improvements in manufacturing technique. (This particular point appears to be clearly demonstrated by the relation between the rates of increase of index numbers composed of the prices of identical materials in raw and manufactured form, which are constructed by the Bureau of Labor Statistics. The rate of increase between 1896 and 1913 in the index constructed from the prices of 27 raw materials was 3.01 per cent, while the corresponding rate for 70 products manufactured from the same materials was 2.03 per cent.) That manufactured goods failed to rise in price at a rate equal to that of raw materials represents, of course, a distinct gain to the consumer. But it is significant that this full gain was not realized in the prices of consumers' goods. (Producers' goods rose at a rate of .97 per cent, while consumers' goods increased at a rate of 2.32 per cent.) In order to trace somewhat more accurately this relation between the relative gains in the prices of producers' goods and of consumers' goods two additional index numbers have been constructed. In the index numbers as originally constructed, food products bulked much larger in the consumers' goods group than in the group of producers' goods. Accordingly it seems proper to omit foods and certain chemical products from both groups.

The additional index numbers measure changes in the prices of those classes of producers' goods and consumers' goods which may be termed, for convenience, industrial products. In each group textiles, hide and leather products and mineral products constitute the bulk of the commodities included. The rate of increase in this restricted group of producers' goods between 1896 and 1913 averaged .94 per cent each year; the rate for the corresponding group of consumers' goods averaged 1.84 per cent a year. Industrial products in the final stage of manufacture were rising in price at a rate exceeding by almost 1 per cent a year the advance in the prices of industrial products at an earlier manufacturing stage.

A probable explanation of the greater relative increase in the prices of consumers' goods is found in the fact that the manufacturing economies which have kept manufactured goods as a whole from increasing in price as rapidly as raw materials are realized, to a greater extent, in the simple primary manufacturing operations from which producers' goods come, than in the later more involved processes. Again, there may be a larger proportion of merchandising costs in the prices of consumers' goods, and it is probable that during the two decades

preceding the War there was no lowering of marketing costs comparable to the decline in manufacturing costs. It is clear, whatever the reason, that the goods in these three broad stages rose in price at quite different rates, the sharpest increases coming at the initial stage of production, with the least increase coming at the intermediate stage.

Of the relations illustrated above, one of the most important is that involving the cost of living and the earnings of labor. My figures for the period 1896–1913 are based upon the index numbers of earnings and living costs constructed by Professor Paul H. Douglas.[1] The index numbers for separate groups constructed by Professor Douglas show very considerable differences. I am using, however, only the general index and the index of earnings of manufacturing labor. The rate of increase in money earnings for all groups during this period was 2.4 per cent, that for workers in manufacturing industries 2.0 per cent. The cost of living increased at a rate of 1.9 per cent per year, so that the purchasing power of earnings, as measured by the general index, increased at a rate of .5 per cent a year. For workers in manufacturing industries the increase in real earnings was at the rate of .1 per cent a year. Disregarding the sub-groups, some of which showed a loss in real earnings during this period, we have a slow but sustained improvement in the well-being of workers in manufacturing industries, and a rather more rapid increase in the real earnings of workers as a whole, for the groups represented in this index.

The general economic significance of some of these relations, with reference to the economic complexion of the pre-war era, is clear, while in other cases the interpretation of the observed differences presents a more complex problem. We may summarize certain of these pre-war situations and tendencies:

1. There was a steady improvement in the well-being and economic power of agricultural producers.

2. The real earnings of American workers, as a whole, increased, with a corresponding improvement in well-being. For wage-earners in manufacturing industries the gain was moderate—at a rate of about one-tenth of one per cent a year.[2] The rate of improvement of this group appears to have been materially less than that of agricultural producers.

3. Raw materials became progressively dearer and producers' goods became progressively cheaper, in terms of purchasing power per

[1] See *American Economic Review*, Supplement, March, 1926.

[2] From Douglas' figures for other groups it appears that there was a decline in the real earnings of governmental employees at the rate of 1.4 per cent a year during this period. Ministers, postal employees and clerical workers suffered declines of real earnings at the rates of .7, .6, and .5 per cent a year, respectively. The real earnings of teachers increased at a rate of 2.0 per cent a year.

unit in the wholesale markets, during this period. Consumers' goods in general rose at a rate almost exactly equal to that of the general level of wholesale prices, but industrial products among consumption goods became relatively cheaper.[1]

4. Foods, at wholesale, rose in price at the same rate as the general index of wholesale prices. The cost of living rose at a somewhat lower rate.

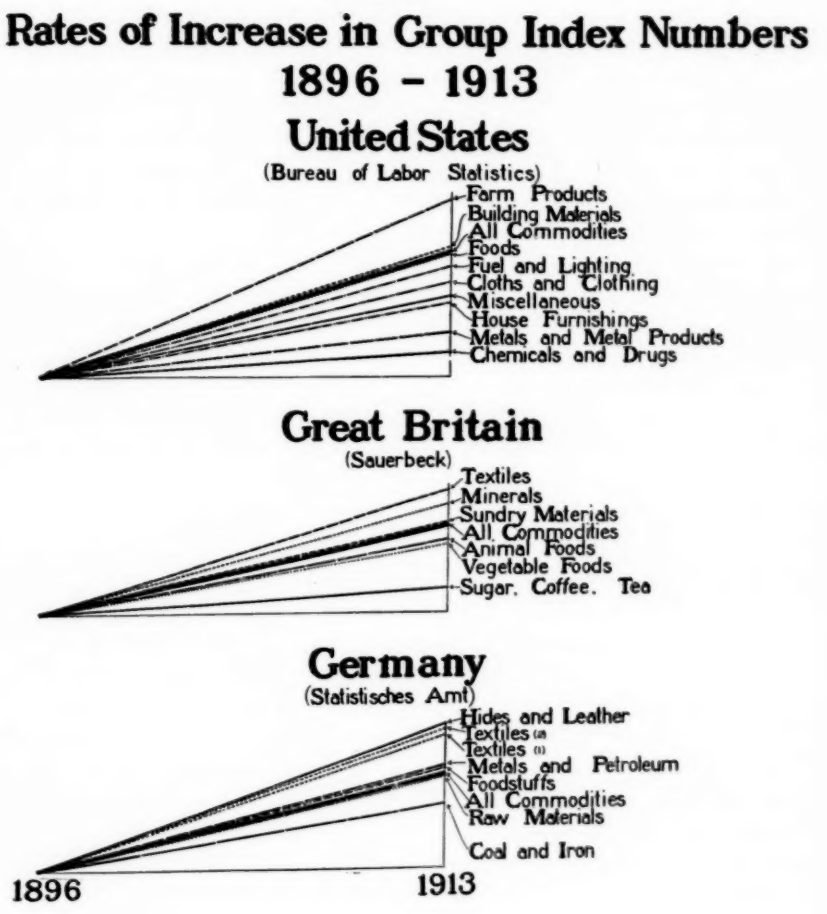
Differences such as those depicted above, between the rates of change over long periods of time of important elements in the price system, involve rather deep-seated changes in economic relations. It would be illuminating to compare different countries in respect to the degree of difference between the rates at which important elements in the system of prices were changing. The sharper such differences are the more radical will be the readjustments called for in the economic organization of a country. In a stable, well-established industrial system, it may be hazarded, the differences between the rates of change would be slight. (In a state of perfect equilibrium, undisturbed by innovations or changes, no such differences between groups would develop.)

We have not now available index numbers representing precisely the same classification of commodities for different countries, for the pre-war period covered by the preceding data. Taking three groupings as they stand, that of the Bureau of Labor Statistics for the United States, Sauerbeck's for Great Britain, and the index of the Statistisches Amt for Germany, a rough idea of the degree of difference between the rates at which different commodity groups were changing in price prior to the War may be obtained. (Lines of trend for these group index numbers are shown in Figure 5.) The differences between the rates of increase for different groups were greatest for the United States (standard deviation of rates of change for individual groups .84), next highest for Great Britain (standard deviation .59), and least for Germany (standard deviation .52). Such a comparison is merely suggestive, for the grouping principles are not the same for the different countries, but I am inclined to think that a more accurate comparison

[1] It seems advisable to stress one point of considerable importance in connection with the differences in the rates of change in purchasing power of the several types of commodities and services discussed above. It is purchasing power per unit of commodity or per dollar of wages received which is in question. A decline in the purchasing power of wages represents a real loss in well-being; a decline in the per unit purchasing power (or value in terms of other commodities) of manufactured goods does not necessarily involve any such loss in well-being on the part of the producers of those goods. This may be due to (and probably, as a long-term trend, is always due to) cheapened production, which may well go hand in hand with higher wages and greater profits. A decline in the per unit purchasing power of agricultural products probably falls in the same category as wages in this respect. Unless such decline is a result of lower production costs (and this is much less likely to be true for agriculture in general over long periods, than it is for manufacturing industries) a decline in per unit purchasing power represents a real loss in economic well-being. Accordingly, somewhat different interpretations of changes in these several price series are called for.

would yield the same result, particularly as regards the relative positions of the United States and the two European countries. This evidence substantiates that previously presented in indicating that the degree of internal disturbance in price relations in the United

FIGURE 5



States prior to the War was relatively greater than in the Western European countries.

II

The discussion of post-war tendencies will deal only with the period beginning with the year 1922. Not until that year was approximate

stability secured after the extreme disturbances which accompanied war-time expansion and post-war deflation.

In approaching this subject we have in mind certain specific questions. To what extent do the price conditions and tendencies which gave to the economic system before the War its particular complexion prevail today? How will post-war conditions and tendencies in the field of prices affect the general economic structure? In what ways will the economic complexion of the era upon which we have entered differ from that of the pre-war era? I wish that I might answer these questions with more conviction that I have. While it is true that one may speak with some certainty regarding the tendencies of the past six or seven years, there can be, of course, no certainty that these tendencies will continue. The summary statements following are to be read with this reservation in mind.

1. The upward trend of the price level during the period 1896–1913, a movement which carried the general index up by 2.35 per cent each year, gave to that period certain of its most pronounced economic characteristics. There is no present evidence that such a tendency will prevail during the period upon which we are now embarked. During the six years from 1922 to 1927 (the figure for 1927 is based upon values for the first ten months) the index of wholesale prices of the United States Bureau of Labor Statistics declined at an average rate of two-tenths of one per cent a year. This represents, in effect, a constant price level. (The slight negative value is too low to be taken as indicative of a real downward tendency.) The significance of this approximate stability need not be discussed here, except to emphasize its obvious bearing upon the buying and selling operations of business men. The world in which the business man of today functions is different in many respects from that in which business was done during the two decades prior to the War. Perhaps the most important of these differences is found in the changed trend of the level of prices.

It is, of course, impossible to say whether an approximately stable price level will prevail during the next decade. It seems improbable that any such general advance as that which occurred after 1896 will take place. One important new factor in the present situation is the existence of a degree of knowledge of the economic consequences of changing price levels which never existed before. Organized intelligence may well play a part which it has never played before in determining the trend of the price level. In the long future we face, I should say, either a declining price level or a stable level. Either condition will give to the economic scene of the next twenty years a color quite different from that of the twenty years before the War.

2. War-time developments gave a sharp check to the downward trend in the variability of individual commodity prices which was in evidence before the War. The range of fluctuations of individual prices was unprecedentedly large during the war years, and this high variability persisted even after the recession of 1920–21. The average of all the individual measures of variability for the 5 years 1922–1926 was 5.1. The average for the 14 years from 1901 to 1914 was 4.4. But to judge post-war conditions by this average alone is to ignore the significant decline in price variability in recent years as shown by the averages of the variability measures for individual commodities. From 1920 to 1926 the average declined from 10.8 to 4.2 (See Table II for the figures for intervening years.)

It is clearly apparent that the pre-war tendency toward greater stability in the prices of individual commodities is still present. The average for 1926 is below the level prevailing at the close of the pre-war period (*i.e.*, it is below the average for every year from 1907 to 1914, except 1913). We may, of course, expect fluctuations in these annual averages, with movements above the 1926 figure, but the existence of the clear downward trend in price variability before the War strengthens the assumption that the degree of variability to be expected in the future will be approximately that which prevailed at the end of the pre-war period, with some possibility that the downward movement will continue. If we may anticipate approximate stability in the price level in the future, the expectation of greater stability in the prices of individual commodities is strengthened. (Changes in the purchasing power of the dollar are not, of course, the sole factor affecting the movements of individual commodities, but this factor becomes of dominant importance during periods of violent change in the price level.)

3. Recent movements of the index of dispersion tell somewhat the same story as do the averages of the variability measures. The well-defined downward movement in the degree of year-to-year dispersion which was in evidence prior to the War was reversed during the disturbances of the period from 1915 to 1921. (See Table I.) Since 1922, however, the average degree of dispersion has been much lower, although somewhat above the pre-war average. (The average for the years 1922–1926 is 10.3; that for the years 1901–1914 is 8.7.) The figures for 1924 and 1926 represent a degree of year-to-year disturbance about equal to that which prevailed during the decade before the War.

In respect, then, to the internal disturbances which are defined by the above measures we appear to stand today approximately where we did in 1913. I think we may expect in the future a degree of such disturbance no greater, on the average, than that which prevailed

during the years immediately preceding the War. It is not improbable, indeed, that the trend of these measures will be downward during the next decade. This opinion, that disturbances of this type may diminish in the future, is based in part upon the movements of the index of dispersion since 1921; somewhat greater weight is given to the definite downward trend in dispersion prior to the War, a tendency which reflected, I think, a slow but fundamental change in the conditions of American business. The probability of declining disturbances of this type is strengthened if one may assume that during the years immediately in front of us there will prevail a stable price level or, at least, one not marked by violent changes. (Considerable changes in the price level, either up or down, tend to increase the dispersion of prices.)

If this view be correct, we may expect in the long future increasing stability in the prices of individual commodities, and greater stability of internal relations among commodity prices. There will be fewer of those abrupt changes in prices and in price relations which characterized the nineties, and which were so pronounced during the war years.

These tendencies, if they persist, have an important bearing upon the economic complexion of the years before us. All that has been said above concerning the slow change that was taking place in the price conditions under which business was transacted during the quarter century preceding the War may be applied to the present and future. A condition of relative stability of prices and of price relations, and a tendency toward greater stability, must involve some change in the direction in which business men look for profits. (A change is meant, of course, with reference to earlier conditions of relative instability, such as those prevailing during the War or in the nineties.) Something of the speculative element will go out of American business. Profits made from the fluctuations of individual prices, and from changes in the relations among prices, will tend to diminish. The high conjunctural profits and the great losses which go with extreme fluctuations in the prices of individual commodities will alike tend to disappear. Business, as well as prices, will be more stable.[1]

We come, finally, to a discussion of the trends of the prices of broad commodity groups in this post-war era. I believe that such differences

[1] These statements all relate to tendencies which, it is assumed, will operate slowly, and which will be subject to numerous interruptions. New inventions, new processes, will offset such tendencies for shorter or for longer intervals. But such tendencies will prevail in the long future, I believe, as they prevailed during the several decades before the War.

I have not dwelt upon the trend of the price level, nor upon the economic effects of changes in this factor. I believe that the tendencies relating to internal stability which have been touched upon above will prevail whether the price level be rising or falling, provided only that the changes in the level of prices be not violent.

in the rates of change in the prices of major commodity groups as were revealed in the study of the pre-war era will be found in any fairly homogeneous period during which the general price index has been marked by a uniform trend or by stability at a constant level. These differences represent deep-seated changes in economic conditions, fundamental shifts in conditions of supply and demand, and such changes will take place whether the price level be changing or not. The post-war era will witness just such changes as did the pre-war years. Unfortunately the statistical basis for determining what these group movements will be is inadequate. We may attempt to approximate these trends on the basis of the behavior of group measures during the six years 1922–1927, and this I have done. But the results are quite tentative and the meanings to be read into them must be carefully qualified.

In this study of post-war trends it has been possible to deal with only certain of the groups distinguished in discussing pre-war tendencies. Each of the measures given below is based upon average annual prices for the six years 1922–1927, inclusive. The 1927 average is based upon prices for the first ten months only (in a few cases, for only nine months). The slight changes which will be made in the 1927 averages when data for the entire year are used will affect only slightly the figures here given.

TABLE IV

POST-WAR TRENDS—AVERAGE ANNUAL RATES OF CHANGE IN CERTAIN INDEX NUMBERS OF PRICES AND EARNINGS, 1922-1927

Index	Average annual rate of change
All commodities (U. S. B. of L. S.)	− .20
Agricultural products, wholesale	.73
Non-agricultural products, wholesale	−1.77
Purchasing power of agricultural products in terms of non-agricultural	2.55
Farm prices (*i.e.*, prices received by producers at the farm)	.98
Foods, wholesale	1.78
Raw materials, wholesale	− .91
Producers' goods, wholesale	−1.58
Consumers' goods, wholesale	.98
Average weekly earnings, New York State factories	2.92
Per capita earnings (manufacturing)	2.49
Cost of living (U. S. B. of L. S.)	.80
Purchasing power of per capita earnings (manufacturing)	1.68
All commodities (Great Britain, Statist)	−1.13
Total foods " " "	−1.85
Total materials " " "	− .57

The lines of trend to which the above measures relate are plotted in Figure 4.

The difference between the pre-war and the post-war trends of the

general price level has been commented upon. Recent changes in certain important commodity groups are of considerable interest.[1]

1. Agricultural products, at wholesale, have risen in price during the six years 1922–1927 at an average annual rate of .73 per cent; non-agricultural products have declined at a rate of 1.77 per cent a year. The net result is that the purchasing power of agricultural products, in terms of non-agricultural products, has increased at a rate of 2.55 per cent a year. (Prices at the farm have increased at a rate of .98 per cent a year since 1922, which corresponds to an increase in purchasing power of almost 3 per cent a year during this period.) This figure may be compared with an increase in the purchasing power of agricultural products at a rate of 1 per cent a year between 1896 and 1913. The higher figure for recent years represents, of course, the recovery from the severe recession in agricultural prices in 1920 and 1921.

The difference between the rates of change in agricultural and non-agricultural prices will doubtless be narrowed, but I should expect during the next decade to find the balance in favor of agricultural products, as it was from 1896 to 1913. The margin may not be as great as it was in the decades immediately preceding the War, but the per unit purchasing power of the farmer's product should tend to increase in terms of other commodities.

2. The relative movements of raw materials, producers' goods and consumers' goods in recent years stand in sharp contrast to the pre-war movements of these groups. Consumers' goods have risen most rapidly, having gone up at the rate of approximately 1 per cent a year since 1922. The other two groups have fallen in price, producers' goods more sharply than raw materials. This relation between raw materials and consumers' goods probably represents a transitory condition. In an established industrial system one would expect raw materials to increase in value, in relation to commodities in general. This was distinctly true of the United States before the War, as it was true of England, and I think it will be true of this country in the future. That consumers' goods should be advancing in price so rapidly, in relation to producers' goods, is probably due in part to the

[1] In the discussion of the post-war trends of these groups one point of some general importance must be borne in mind. The discussion of pre-war trends dealt with the period from 1896 to 1913; the treatment of post-war trends is restricted to the period 1922–1927. Developments during the intervening years have been ignored. There is justification, I think, for considering developments during the period 1914–1921 as so much water under the bridge, and for neglecting these in attempting to trace post-war trends. Yet events during this disturbed period have influenced recent trends. The fact that agricultural prices have risen in recent years, while non-agricultural prices have declined, is in part a result of the more severe recession in agricultural prices in 1920–21. Therefore, although we deal with trends since 1922, it is well to remember that these trends are not set off sharply from the developments of the preceding period.

influence of foods in the former group. The prices of consumers' goods may continue to rise in relation to producers' goods, as they did before the War, but one would expect the difference in trends to be much less pronounced than it has been during the past six years. The introduction of additional economies in the later stages of industrial production and in merchandise distribution would serve to lower this margin.

3. The sharp difference between the post-war trends of the prices of foods and of all commodities stands in contrast to the pre-war situation, when foods and all commodities increased at almost identical rates. The movement of food prices in the United States differs materially, we may note, from the trend of food prices in England. In the latter country foods have become progressively cheaper in terms of other commodities, the tendency in this direction being pronounced both in the pre-war and post-war eras. This situation probably reflects the peculiar national economy of England. In both France and Germany, as in the United States, pre-war trends of food prices were very close to those of all commodities. The difference between the post-war trends of foods and of all commodities in the United States in recent years is temporary, I think, and will not endure. The margin should be lessened, if it does not disappear in the near future.

The trend of food prices in a modern industrial economy probably represents the resultant of conflicting tendencies—rising costs of raw food materials and increasing economies of manufacture and distribution. In England, before the War, the latter tendency was undoubtedly present, and the former was not strongly operative because of the character of the sources from which England's food supplies were drawn. The result was a marked cheapening of food, in relation to all commodities. In the United States, Germany and France the two tendencies appeared to neutralize each other, and food prices rose at about the same rate as general commodity prices. The sharp upward trend of food prices in the United States since 1922 represents in considerable part the recovery of agricultural prices from the great post-war decline. In the longer future I think we may expect approximately the same balance of conflicting tendencies which equalized the rise in food prices and in the prices of all commodities before the War.

4. The final comparison of post-war trends relates to the earnings of labor and the cost of living. Here is the most important relation in the price system, from the point of view of the wage-earning community at large. In the years between 1896 and 1913, we have seen, there was an average annual increase of about one-half of one per cent in

the real earnings of those workers included in Professor Douglas' index. The increase in real earnings was at the rate of one-tenth of one per cent a year for manufacturing labor. I regret that I have not figures for this index, and for the corresponding cost of living index, which come up to date. In measuring changes in the per capita earnings of manufacturing labor in post-war years I have made use of the figures for earnings in New York State factories, and of an index of per capita earnings derived by dividing the pay-roll index of the Bureau of Labor Statistics by its employment index.[1] Both index numbers relate to the same group of industries. The cost of living index of the Bureau of Labor Statistics for the period 1922–1927 has been employed. The average annual rates of change in these several indexes are given in Table IV.

Real earnings of manufacturing labor in the United States have been increasing at a rate of approximately 1.68 per cent a year since 1922, if we use the earnings figure for the country at large. The New York figures show a gain at a rate of about 2 per cent a year. (The validity of both figures depends, of course, on the adequacy of the cost of living index employed. If account were taken of retail food costs alone the gain in purchasing power would be lower.) It is possible that the relative gain will be less in the future, but it is probable, in my opinion, that the trend of real wages in manufacturing industries in the United States will be upward. The economies of manufacturing production, which have lowered and should continue to lower the costs of producers' and consumers' goods relative to raw materials, should continue to accrue in part to the benefit of manufacturing labor, a result which is perhaps the more likely because of immigration restriction. The future trend of the price level, too, will have some bearing upon the trend of real earnings. That the trend of earnings of manufacturing workers exceeded the trend of living costs by such a slight margin in pre-war years was probably due in part to the fact that the trend of the general price level was upward. The customary lag of wages would, under these conditions, impede wage readjustments and tend to bring the lines of trend of wages and living costs closer together. If the future level of prices is to be stable, or declining, the gain in real earnings should be more pronounced than it was during the decades before the War.

Each of these projections into the future involves, of course, a considerable element of uncertainty. But there is a reasonable basis for each of them. It is not illogical to assume that certain clearly

[1] This procedure was suggested by Professor Paul F. Brissenden, who has made use of it in other studies.

defined pre-war tendencies, tendencies which have re-asserted themselves since the sharp disturbances of the war years, will continue to prevail. In respect to each of these tendencies the purely empirical argument based upon the observed behavior of prices in pre-war and post-war years is supported, I think, by theoretical considerations. Assuming that these tendencies continue we may expect in the long future more stable prices and greater stability in business operations, a decline in the relative importance of purely speculative factors in business, and a decline in the proportion of total national income which goes to business in the form of conjunctural profits. Accompanying these tendencies in the realm of business we may expect a slow but sustained increase in the purchasing power of agricultural products, and a gain in the real earnings of manufacturing labor at a rate somewhat greater than that which prevailed during the two decades before the War.

SOME FALLACIES CONCERNING INDEX NUMBERS

By Willford I. King

During the last decade, the subject of index numbers has been treated at length in several new books, and two or three of these volumes have provoked lively debates in statistical circles. These discussions have thrown much light into places previously dark, but it is my contention that, even yet, the science of index numbers is beset with many serious fallacies, some of which are widespread. My purpose is to call attention to a few of those which I believe to be most pernicious.

TYPES OF REASONING GIVING RISE TO FALLACIES

As I see it, these fallacies, in the main, have their origin in one of the three forms of careless reasoning listed below:

1. Failure to recognize the fact that any given mathematical formula answers one question and one only.
2. Failure to define accurately the question which it is desired to answer.
3. Failure to distinguish between the treatment demanded by complete data and the treatment best suited to sample data.

These three types of errors are so closely interwoven that it is necessary to discuss them in conjunction rather than seriatim.

The literature in this field is largely devoted to a discussion of the merits of various index numbers. The authors are always pointing out features which supposedly make certain index series good or bad. Sometimes the discussion deals with published index numbers; sometimes it centers around mathematical formulae. In both instances, however, the criteria of merit are, as a rule, delightfully hazy. Professor Irving Fisher's book on *The Making of Index Numbers* furnishes, however, an outstanding exception to this rule, for the author has seen the necessity of setting up a definite standard and he has therefore established one and kept it in mind throughout a large part of his discussion. The standard which he has chosen is his "ideal" formula—a formula which, as he shows by experiment, represents the central or modal tendency of a great number of index series. In his opinion, that index series is best, the path of which conforms most closely to the course of his "ideal" index number.

At this point, I desire to present two theorems which seem to me both basic and axiomatic, but which are often overlooked or ignored in dis-

cussions of the topic at present under consideration. These theorems are:

1. There are a very large number of specific questions for which people desire to have answers furnished in the form of a series of relative numbers.

2. It is usually easy, in the case of a specific question, to work out the mathematical formula which, if applied to complete data, will give the precise comparison desired. A thousand different questions may require a thousand different formulae. Each of these formulae gives the exact answer to one question and one only.

Whenever, then, complete data are utilized to answer precise questions, any comparison of the merits of different formulae is evidently beside the point, for the formula is determined by the question asked. Observe, however, that, in order to give an exact answer, the statistician must have

1. A precise question.
2. Complete data.

NECESSITY OF DEFINING QUESTION CLEARLY

All of us know that most arguments in the field of social science have their origin in the fact that the opponents are using the same terms with different meanings. Unfortunately, a similar tendency to lack of clarity in definition appears in most of the debates concerning the merits of various index numbers. Neither party takes the trouble to state what question the index number is expected to answer.

Even when the question is stated, it is often set forth in terms which, while apparently precise, are, in reality, extremely hazy. Recently, for example, many people have been inquiring whether prices in the United States have been rising or falling since 1923. Prices of what? According to *The Survey of Current Business*,[1] various classes of wholesale prices in September, 1927, differed from the 1923 average by the following amounts:

	Per cent
Producers' goods	—15
Consumers' goods	+ 1
Raw materials	— 1

while the variations in retail prices were as follows:

	Per cent
Retail food prices	+ 6
Cost of living	0

[1] August 1927, pp. 25, 26, 125; November, 1927, pp. 5, 9, 20.

and in security prices the changes are represented by the following figures:

	Per cent
Stocks	+53
Bonds	+16

By what token do the values representing any of these groups of commodities claim the right to monopolize the broad term "*prices*"? Are wholesale prices so much more important than retail that the latter can be relegated to the junk heap? What grounds are there for this discrimination? Are security prices to be ignored? Why?

There is at least one authority on index numbers, Mr. Correa M. Walsh, who cuts the Gordian knot by saying that there is only one problem with which index numbers can legitimately deal—namely that of measuring changes in the general purchasing power of money.[1] At the present time, when index numbers are actually being used for a thousand other purposes, it requires a considerable strain on the imagination to put one's self into Mr. Walsh's frame of mind. Let us suppose, however, that this feat has been accomplished, that we have all the data in perfect form, and as many millions as we need, to pay for the services of computers. How should we proceed to calculate precisely changes in the general purchasing power of money?

Manifestly the quantity sought is the average exchange ratio between money and goods. In the United States, fortunately, money is homogeneous and the value of the entire stock can be expressed in dollars. Goods, however, are extremely heterogeneous and must, perforce, be measured in a great variety of units. Furthermore, the number of units of each kind sold changes every day in the year. How can we consolidate all of these transactions into a unified whole? Obviously, we cannot add tons of coal to bushels of apples and yards of muslin. The best plan yet proposed for bringing order out of this chaos is that suggested by Professor Fisher in his work on *The Purchasing Power of Money*, namely that of taking as units the amounts of the respective commodities selling for $1.00 at the base date. This method seems, at first, to solve the puzzle definitely and efficaciously. Unfortunately, however, there still remain two flies in the ointment.

1. A shift in the date chosen as a base may change the course of the series of figures supposed to represent the movement of the general price-level, and, since there is no way of deciding which base is best, it is impossible to say which index series is correct. The use as a base of the average of the items for several dates does not settle the matter, for

[1] See *The Problem of Estimation*, p. 116.

someone else may prefer a different average, and one's choice is as good as another's.

2. There are important classes of commodities for which it is impossible to obtain units which are comparable from year to year; for example, a building deteriorates, and hence represents a different physical quantity in 1927 than it did in 1907. Furthermore, a given piece of real estate is ordinarily sold at intervals so infrequent as to make its price quotations ill-adapted for use in an index number. Shares of stock represent fractions in the ownership of a constantly changing aggregate of physical assets. Automobiles, locomotives, radio sets, furniture, etc., vary so much in style from year to year that it is extremely difficult to secure quotations on comparable units for even two successive years.

Clearly, then, neither is the general purchasing power of money a concept susceptible of clear definition nor is it possible to secure a precise measurement of the quantity when it is given an arbitrary but specific definition.

The fact must, then, be recognized that, even though the question is made perfectly definite by using Professor Fisher's device for measuring the quantities of goods exchanged and by arbitrarily choosing a date for the base, the nature of some of the data is such as to preclude the possibility of measuring with precision the changes that have occurred in the purchasing power of the dollar.

Fortunately, however, there are more circumscribed fields in which the completeness of the data leaves little to be desired and in which, therefore, many questions can be answered with a high degree of accuracy, provided they are specific and there is available the time and energy required for the necessary computations. The New York Stock Exchange is an example of such a field. Reasonably accurate records of all sales during a considerable period of years are available for study. Under such circumstances, it is not surprising that, for a decade or more, several index numbers of stock prices have been compiled and published and, recently, two or three new ones have been added to the list. As it happens, however, these different index series sometimes show radically different trends, and, whenever they do, there is much discussion as to which formula is right and which is wrong. Such discussion obviously implies a belief that the stock market has a single specific trend to which every good index series should conform. Is this assumption correct?

A study which I have made of the behavior of the prices of 90 stocks between November, 1916, and March, 1925, seems to prove conclusively that the hypothesis mentioned is decidedly at variance with the facts.

The truth is that the movement of the index is dependent upon the nature of the question which it answers. This fact may be illustrated by the following examples.

Suppose, first, that we wish to know how a man would have fared who, at the crest of the boom in 1916, purchased ten shares of each of the 90 stocks covered by the study, kept all such stock as he received in the form of stock dividends, and finally sold his holdings in March, 1925. We find that, in addition to his cash dividends, he would have made a profit of only 11¼ per cent on his investment.

Let us suppose, on the other hand, that we wish to inquire into the fortunes of the man who, at the same date before mentioned—namely November, 1916—bought not ten shares of each of the 90 stocks, but, instead, purchased $1,000 worth of each of these same stocks. The figures show that, if he sold all his holdings in March, 1925, his profit, excluding dividends, would have amounted to 101⅓ per cent on the money which he put into the enterprise; in other words, his relative gains were nine times as great as those of the first investor.

Now, is it logical to say that one of these inquiries is legitimate while the other must be ruled out? Obviously not. Just as obviously, no index series which gives the correct answer to the first question can give even an approximately accurate answer to the second question. Clearly, then, the fact that various index series differ from one another does not necessarily indicate that any of the index numbers are faulty. In most instances, all that is shown is that the different index numbers are so designed as to answer different questions. When index numbers have different trends, it is, then, much more pertinent to ask what question each index number is adapted to answer than it is to inquire whether one is better or worse than another.

THE TEST OF MERIT FOR INDEX SERIES DERIVED FROM SAMPLE DATA

As stated above, if data are *complete* and funds ample, it is usually possible to devise a formula which will answer exactly a specific question about the course of prices. In most instances, however, price records are incomplete, and this fact, as well as lack of time or funds, forces the statistician to depend upon sample data only for the computation of an index series.

Now, clearly, the end to be striven for is to obtain from the sample data an index series conforming in every detail to the correct index series which could be obtained if complete data were available and were utilized. The formula that gives results most closely approaching this ideal is evidently the best formula. This is the sole test of merit which can legitimately be applied to a formula, and all such supposed criteria

as the circular test, the time-reversal test, the factor-reversal test, and the commodity-reversal test must obviously go into the discard.

So far as I have been able to judge from their writings, the inventors of these tests have, consciously or unconsciously, assumed that, at a given place in a given period, the course of prices can be represented by a single curve. As we have seen, this is distinctly contrary to the truth. The total value of one basketful of commodities fluctuates in one manner; the total value of a second basketful moves in another way; in short the value will be represented by a new curve every time the make-up of the contents of the basket is varied. All of these curves are definite and represent something real, but when one attempts to average several of the curves or force one to conform to the outline of another, the results are neither fish, flesh, nor fowl, and no one can tell what they mean.

The truth is that the protagonists of such tests as those mentioned above have failed to formulate clearly in their own minds the problems which they are trying to solve, else they never would cling to such standards of merit.

Now since, as I have shown, it is possible to obtain from the same complete mass of data a number of series of relatives differing radically from one another, although each answers precisely some definite question, it is manifestly true that no single formula applied to a sample could possibly yield an index series approximating all the varying series obtainable from complete data. With sample data, as with complete data, then, different formulae must evidently be used to answer different questions. This fact has been recognized by many students of index numbers.

Apparently, however, it has, in general, been tacitly assumed that the formula which, with *complete* data, answers a question accurately must be the one which will give the most accurate results when applied to *sample* data. My curiosity having been aroused concerning this assumption, I decided to test its validity as applied to prices of commodities at wholesale.

The material used in the tests which I am about to describe is made up of 336 price relatives on the base 1919 computed from the quotations on wholesale prices compiled by the United States Bureau of Labor Statistics. In order to reduce the amount of computation, quotations have been taken only at the dates of the major turning points in the course of the averages compiled by the United States Bureau of Labor Statistics, namely August, 1915, August, 1917, May, 1920, January, 1922, and August, 1925.

Before making any tests to ascertain which of several formulae,

when applied to sample data, would come nearest to answering a specific question, it seemed advisable to look into a point stressed by Professor Fisher—namely the supposed bias of certain formulae. Those familiar with his book on *The Making of Index Numbers* will remember that he contends that the simple arithmetic average of relatives has "an upward bias" while, on the other hand, the harmonic average of relatives has "a downward bias."

There is no escaping the fact that, when several quantities are averaged, the geometric average will always be less than the arithmetic and larger than the harmonic average, except in the particular case in which all the quantities averaged are equal in size. Furthermore, the difference in the three averages will increase as the dispersion increases among the items averaged.

Clearly, when we are averaging a series of price relatives on a common base, the three averages are forced together at the base date. It is obvious also, that, as we depart from this date in either direction, dispersion of prices will increase and hence the differential between the three averages will grow in size. It is not clear, however, that the mere fact that the geometric average happens to occupy the central position justifies us in taking it as a standard. It appears equally reasonable to use the arithmetic average as a standard and say that both the other averages have a downward bias.

The fact may be noted in passing that, when the three averages are applied to the original price quotations instead of to the price relatives, all tendency for the index series thus derived to occupy any fixed relationship to each other disappears.

The reason for the three averages of relatives occupying the comparative positions that they do, is, then, explained by their mathematical characteristics, but Professor Fisher in his book on *The Making of Index Numbers* makes an assertion which is much more difficult to understand when he states that the course of the simple arithmetic average of relatives has "an upward bias" as compared to that of the aggregative index which he points out is identical with the arithmetic average of relatives weighted according to the total value in the base year. I was at a loss to understand why this should be true. A little thought must convince any statistician that the simple arithmetic average of relatives can rise above the weighted arithmetic average of relatives only in those instances in which the articles of small aggregate value in the base year increase in value more than do those of greater value. Is it really true that unimportant articles are ever growing dearer as compared to important articles?

To ascertain the facts I separated into three classes, on the basis of

weights assigned by the United States Bureau of Labor Statistics, the 336 articles for which continuous records are obtainable in the reports of that Bureau. The first class contains those commodities which the above-mentioned Federal Bureau estimates to have constituted in 1919 in each case less than 0.10 per cent of the total value of all commodities. The second class is made up of the commodities running from 0.10 to 0.24 per cent, and the third class of those over 0.24 per cent. The relatives for each class, all on the base 1919, were averaged. The three series of index numbers thus derived show the following results for the decade between August, 1915, and August, 1925.

The 126 least important commodities on the average rose 21 points as compared to 31 points for the 117 most important commodities. This would seem to indicate that the simple arithmetic average would have a "bias" *downward* instead of the *upward* one found by Professor Fisher.

Furthermore, if we separate the commodities into five classes on the basis of the nature of the commodities, we find that the least important commodities rose more sharply than the most important commodities, in the case of miscellaneous goods ready for sale to retailers for resale to direct consumers and in the case of tools and materials used in building, while in the three other classes of commodities, namely foodstuffs, farm produce, and miscellaneous indirect goods, the reverse was true. In three cases out of five, therefore, it seems that the simple arithmetic average should have a *downward* bias.

To test the matter more directly, simple and weighted arithmetic averages were computed from each of 18 samples, each sample being made up of 31 items selected proportionally from among the various groups into which the 336 commodities had been divided. A study of these series of index numbers shows that, in 11 cases out of 18 the simple arithmetic averages rose more points than did the weighted arithmetic averages, a finding which apparently confirms Professor Fisher's belief that the simple arithmetic average has an *upward* bias. However, those of the weighted averages which rose, went up much faster than did the simple averages and, by so doing, gained sufficiently in amount to make the increases for all 18 samples combined practically the same for both types of averages, the rise of the aggregate for the weighted being just a trifle the larger.

If, however, we confine our study to the period 1919 to August, 1925, we find the *upward* bias of the simple as compared to the weighted arithmetic average indicated by 13 out of the 18 samples and also by the total of the 18 samples. Once more Professor Fisher gains support for his contention. But, unfortunately, when we turn to the period

August, 1915 to 1919, we discover that the simple as compared to the weighted arithmetic average has a *downward* bias in 12 out of the 18 samples and in the aggregate of the 18 samples as well!

With the findings so contradictory in nature, it appears evident that one is not justified in saying either that unimportant commodities tend to rise in price faster than do important commodities or that the simple arithmetic average has either an upward or downward bias as compared to the weighted arithmetic average. The probabilities are that all the differences shown are due purely to chance or to conditions happening to prevail during the particular periods chosen for examination, and that, over a considerable period of time, there is no correlation between commodity price movements and importance of the articles. It appears, then, that Professor Fisher was misled by purely accidental characteristics of the price quotations that he used in his experiments and that the use of the simple arithmetic average in the construction of an index series has no consistent tendency to give to that series a slope different from that of the series obtained by using the weighted arithmetic average.

As we have seen, the merit of an index number is determined solely by the closeness with which the series derived from sample data conforms to the course of that series of relatives derived from complete data, which correctly answers a given question. I will describe in closing the experiments made to see how nearly various formulae, when applied to small samples, would come to giving the correct answer to the following question: *What were the relative values, at the five different dates covered, of a basket containing 336 commodities each in proportion to the total value of that particular commodity produced in 1919 as estimated by the United States Bureau of Labor Statistics?*

The figures at hand enabled us to compute a series of relatives giving the precise answer to the question asked. The problem was to see how closely this same series of relatives could be approximated by using a small sample containing only 31 commodities. In order to avoid basing conclusions upon accidental results, the tests were repeated upon some 30 different samples. In some of the cases, the samples were selected at random; in others they were chosen proportionally from various classes, the classes being based upon the nature and importance of the commodities. Errors were measured in terms of percentages of the true relatives for the given dates.

As the statistician might expect, the proportionally selected samples consistently show smaller percentages of error than do those selected at random. However, the differences in the results obtained by the two methods are not at all striking.

To me, however, the most surprising fact brought out by the experiment is the way in which the different types and averages arrange themselves when arrayed on the basis of their respective errors. Strangely enough, although we are trying to approximate the answer to a query which requires with *complete* data the *weighted* arithmetic average to give the correct answer, it is the much-maligned *simple* arithmetic average of the 31 relatives in the sample which has the smallest error. With the proportionally-selected samples the average errors of 18 samples for all periods are shown by the following figures:

	Per cent
Simple arithmetic average of relatives	5.39
Geometric average of relatives	5.47
Weighted arithmetic average of relatives	6.95
Median of relatives	7.36

Furthermore, the simple arithmetic average is superior to the geometric average in 12 out of 18 samples and at three out of the five dates covered. When the simple arithmetic average is inferior to the geometric, it is because the former is affected the more adversely by one or two erratic items. The method of overcoming this weakness will be described later.

The simple is superior to the weighted arithmetic average in 15 out of the 18 samples and at four out of the five dates studied.

WHY THE SIMPLE AVERAGE IS BEST FOR THIS PARTICULAR PURPOSE

The explanation of this surprising phenomenon seems to be that, in a small sample, an erratic movement in the price of a single *important* commodity plays havoc with the accuracy of the weighted arithmetic average. With the simple arithmetic average there is not the danger of having a large weight combined with an erratic price movement.

Obviously, however, as the size of the sample is increased, a point must eventually be reached when the weighted arithmetic average will prove superior for answering this specific question. Extensive experimentation shows, nevertheless, that the simple arithmetic average is, for this particular purpose, superior, certainly until the sample is increased to include as many as 93 items. At four out of the five dates covered, the simple arithmetic average proved superior for samples containing up to 186 items. At one of the five dates, the superiority of the simple average actually continued until the sample included 248 out of the 336 items in the totality.

Whether the average used is the arithmetic, geometric, or harmonic, very large errors are often introduced into the average of a small sample by the erratic behavior of the prices of one or two commodities.

Numerous tests have been made to ascertain whether or not there is any feasible way of diminishing the extent of such errors. The best device discovered for reducing errors to a minimum is to eliminate from the sample all price-relatives varying from the median of the sample by more than six times the inter-quartile range.[1] The use for this purpose of a deviation either materially larger or smaller than this is found to increase the error. No other device has been discovered which has any merit whatever.

I shall now summarize the points covered, for space is lacking to describe the numerous other experiments made in testing index numbers designed to answer other questions.

SUMMARY

I have endeavored to show that:

1. Any given index series can, at best, be expected to answer correctly one question only.
2. With *complete* data it is commonly possible to answer a given question precisely.
3. Index numbers derived from *sample* data are good just in so far as they give a series approximating the one derived from complete data which exactly answers the question asked.
4. Such supposed tests of merit as the time-reversal test, the factor-reversal test, the commodity-reversal test, and the circular test are based upon false premises and have no merit whatsoever.
5. While certain averages of relatives occupy definite relationships with regard to one another, the use of the term "bias" in this connection is ill-advised.
6. The simple arithmetic average of relatives has no constant tendency to deviate from the weighted arithmetic average in any particular direction.
7. In place of being a worthless average, the simple arithmetic average is, for certain purposes, distinctly the best average to use.
8. In using small samples, errors can be reduced by eliminating all items varying from the median of the sample by more than six times the inter-quartile range.

[1] Credit for suggesting this general mode of attack is due to Dr. Maurice Leven, Statistician of the New York State Housing Commission.

SOME IMPORTANT PRINCIPLES OF INDEX NUMBER CONSTRUCTION

By Robert W. Burgess

In order to provide a background of summarized facts as a basis for price forecasts, determination of policies, and analysis of operating results, the Western Electric Company maintains a considerable number of internal index numbers. The principal index numbers in use are as follows:

(a) An index number of the prices paid for all raw materials used in the manufacture of lead covered cable and another one for materials used in the manufacture of telephone apparatus.

(b) An index number of sales prices to Bell Telephone Companies of all merchandise sold to them by the Western Electric Company, either as a manufacturer or as purchasing agent for the Bell System. This index number is a composite of four index numbers covering:

(1) Lead covered cable.

(2) Telephone supplies—that is to say, telephone poles, directories, wire and strand, and various items purchased for the System and sold without change of form.

(3) Services, principally installation of central offices.

(4) Telephone apparatus, that is to say, all specialized telephone material, aside from lead covered cable.

(c) An index number of sales prices for the Graybar Company.

(d) A shop cost index for telephone apparatus.

(e) Indices of plant costs (buildings and machinery) for use in connection with special depreciation reserves, and as a guide for decisions as to new construction.

(f) Indices of weekly earnings of certain groups of employees.

As we have worked over these various indices, the following principles of construction have been emphasized:

1. The simplest and most satisfactory formula for index numbers, which should be used wherever possible, is $\frac{\Sigma Qp'}{\Sigma Qp}$, where the weights Q are average quantities for a recent period, p' represents current year prices, and p base year prices. The results based on this formula carry conviction when applied to particular problems, as we can say, in simple words, that such an index number compares, for instance, what would have been paid at various dates for the amounts actually purchased in the three year period 1923–25, inclusive.

2. It is frequently inconvenient or impossible to use quantities directly as weights when an index number is built up combining several indices for different sub-classes. The weight for each component should then be based on the proportion which the sales (or purchases, or what not) of the corresponding sub-class are of total sales. The essential point, in such cases, is that this proportion must be based on value at *base year* prices. When each sub-class contains only a single item, the formula expressing this method of weighting reduces to $\sum\left[\frac{Qp}{\Sigma Qp}\ \frac{p'}{p}\right]$, which is obviously equivalent to the first quoted.

While the principle of reducing values to the base year price level before establishing these weights can hardly be claimed to be new, it is often ignored, with results which I regard as technically incorrect. For instance, the well-known index of the cost of living prepared by the Bureau of Labor Statistics combines the indices for food, rent, clothing, and so forth, on the basis of percentages computed from relative expenditures for these items in 1918–19. If the expenditures for each classification are first reduced to the 1913 price level, on the basis of the December, 1918, group indices found by the Bureau of Labor Statistics, the weights turn out to be as follows, as compared with the present official weights:

	Official weights (Proportions at 1918–19 prices)	Improved weights (Proportions at 1913 prices)	Proportions at June, 1927, prices
Food	38.2	34.3	31.4
Clothing	16.6	13.5	12.8
Rent	13.4	20.6	19.3
Fuel and light	5.3	6.0	6.3
Furniture and furnishings	5.1	4.0	4.7
Miscellaneous	21.3	21.6	25.5

I have called the new weights "improved" rather than "corrected," as no inferences based on war-time budgets can be counted "correct," and the use of December, 1918, prices to reduce to the 1913 price level is necessarily an approximation.

Using these "improved" weights, I find an "improved" index number of the cost of living, which compares with the present number as follows:

	Present	"Improved"
1913	100	100
December, 1918	174.4	167.6
December, 1919	199.3	190.7
December, 1920	200.4	195.2
December, 1921	174.3	173.8

In December, 1922, and thereafter, the differences are immaterial, The differences are due largely to the lag in the rise of rents. Because of this lag, the official weights, based on 1918–19 prices, minimize the relative importance of rent. The high price level of food and clothing in the years 1918–20 has been given a double effect in raising the present index, first, in the weight factor where it should not function, and second, in the price factor.

3. The third principle brought home to us by our experience is that a different index number, or a different method of using index numbers, is needed to "deflate" sales to a constant price level, than is used, as previously discussed, to show the price level. The simplest procedure for deflation is first, to divide total sales into classes, within each of which the price variation has been reasonably uniform, and then secondly, to reduce each class of sales to the price level of the base year by dividing it by its appropriate index number. The total of these deflated sales is, therefore, the desired figure. This scheme, it is evident, automatically allows for differences in relative weights as between various classes of items.

The importance of the differentiation between these index numbers for different purposes was brought to our attention most forcefully in connection with the Graybar sales, of which an important component is incandescent lamps. As the price index for lamps is decidedly below 100, on any method of construction, while other components, such as pole line hardware, are nearly 200, the effect of different weighting from month to month is very marked. Absurd results followed any attempt to "deflate" by the index number on a constant weight basis, which is properly used to show price level.[1]

Armed with this method of deflating, I should like to participate in the discussion begun by Mr. Snyder and Professor Crum in the April, 1926, issue of the *Harvard Quarterly Review of Economic Statistics*. Professor Crum believes that in the use of a price index to deflate bank debits, as proposed by Mr. Snyder, "any kind of reasonable accuracy is highly improbable," and he "would propose that this reservation of the author be stamped across every problem in statistical deflation." In my opinion, this stamp can be dispensed with if the deflation has been done by the method just discussed and the price variation within each of the component classes has actually been reasonably uniform. As this condition can often be satisfied in the analysis of internal statistics of a business concern, the process of deflation seems to me thoroughly sound and valuable, in fact indispensable in the interpretation of current sales reports.

[1] For a numerical illustration of this point, see *Introduction to the Mathematics of Statistics*, by the writer, pp. 120–123.

While I thus disagree with Professor Crum in his conclusions as to the general unreliability of deflation, my line of argument does not lead to confidence in the results obtained by Mr. Snyder in deflating bank debits. It is obviously impossible to break down bank debits into classes within each of which price variation is reasonably uniform. It may be that some adjustment of weights can be found which will be equivalent to the process recommended above, but at present I feel that the margin of doubt, if not error, is rather wide.

4. The fourth principle we have noted is that use of the "chain" method of construction is made safer if the following precautions are observed:

(a) Apply the method only to a homogeneous class of items whose price changes are similar.

(b) Use as few links as the changes in the list of items permit.

As may easily be shown by numerical examples, inaccuracies possible with the chain method become serious when links are frequent and the price trends of the items included diverge widely.

The significance of precautions (a) and (b) may be pointed out by reference to the price index of telephone apparatus. Changes in design are so frequent that hardly any items could be found which were actively in production both in 1914 and 1926. It was possible, however, to divide all telephone apparatus into classes, such as cords, jacks, loading coils, repeaters, receivers, transmitters, etc., each of which was fairly homogeneous as a class. It was then possible by the chain method to determine a price index number for each of these classes. The combination of these class index numbers was then made in accordance with "relative value" weights, leading to a satisfactory measure of the price changes of all telephone apparatus.

To summarize briefly, then, the principles of index number construction which have been emphasized in the experience of the Western Electric Company are as follows:

1. If you can, use the "market basket" formula with weights based on recent experience.

2. If a composite index is constructed by combining several indices, the weights should be proportions of value at base year prices.

3. Sales may be deflated satisfactorily by analyzing into classes and reducing sales of each class separately to the price level of the base year.

4. The "chain method" may be used more safely if applied only to a homogeneous class of items, with few links in the chain.

SOME INDEX NUMBER PROBLEMS OF GENERAL ELECTRIC COMPANY

By Frank B. Cliffe

The invitation to present a paper at this meeting suggested that I tell some of the problems General Electric Company has encountered in compiling an index number of its selling prices. The solutions we have used, in some cases, have been expedient rather than technically sound, and I give them as suggestive of simple methods for obtaining results that appear to be sufficiently accurate for a general survey.

General Electric Company manufactures nearly everything known to the electrical industry—motors, generators, transformers, radio, refrigerators—in all, several hundred thousand articles, if we consider the different sizes, voltages, frequencies, etc., in which many electrical products are required. Our first problem, then, was that of selection and sampling.

Our product was grouped into about fifty main classes, for each of which we developed a separate price index by selecting within that class several representative devices for which there was large demand, and whose price movements were characteristic of other devices in the same class of product.

The next important problem was that of weighting each price index in compiling the composite figure for the Company. That was first done upon the basis of the output for the then current year. While this was satisfactory as a means of measuring physical volume, it was distorted as a composite measure of price changes, because the cycle of demand for certain classes of our output reaches its peak at a time quite different from that for other classes. The price movements of the various classes have not been parallel, nor have they always been in the same direction during a given period.

For measuring price changes the weights should therefore be measured by a longer period than the current year.

Third of the problems was that of changes in the trend of demand. As an illustration, I shall cite an instance that has been noticed by most of us. Ten years ago, the carbon arc lamp was the common form of street illumination, and a very important part of General Electric Company's business. With the improvements that have been made in tungsten, gas filled incandescent lamps, the carbon arc lamp is being replaced in our output by the incandescent lamp, which is an entirely different article, and without any direct relationship of prices. Weights

based on pre-war experience would thus give too much emphasis to arc lamps, and not enough to the incandescent lighting units. We have decided to establish a new set of weights each five years, based, as suggested above, upon the production of the three years immediately preceding. At the same time, we correct for the increasing inaccuracies of dispersing price trends by adopting a new base, and then adjusting our resulting figures to serve as a continuous series.

Fourth is the problem raised by important new products. While they may be introduced without disturbing the index number for the first year, their prices are apt to be reduced rapidly if demand is greater than expected and the number sold justifies the use of quantity production methods that reduce the cost and selling price per unit. With other articles, commercial use shows the need for changes in design which may require substantial increases in selling prices. This has led us to disregard such new items for a year or two, until they have become somewhat established. This appears to be justified by the fundamental concept of an index number as a measure of change for identical articles.

Closely related to the preceding problem is one which arises because we have a large Research Laboratory and hundreds of engineers who are continually improving our product. We are not selling identical units from year to year. The motor of today is quieter in operation, has greater output with smaller bulk and weight and has better electrical characteristics than its prototype of five or ten years ago. Each year brings improvements that we have not been able to reflect in figures. At least to this extent we know that our index understates the utility value of our products to their numerous users. This does not invalidate it as a method of measuring volume of output.

I have briefly outlined the problems that have arisen in preparing an index number from our own data. Some of these are different from those usually encountered in working with published figures and I trust that the statement of the problems and the method of solution that we believe to be satisfactory as a comparison of nearby years, and fairly accurate for a decade will be of assistance to others who are primarily interested in the internal or operating statistics of a manufacturing enterprise.

SEASONAL VARIATION IN THE PRODUCTION OF STEEL INGOTS

By W. Floyd Maxwell

In the pre-war period much thought had been given to the problem of measuring changes in the general price level, while but little had been done in constructing measures of the physical volume of goods produced. The abundance of current price data in contrast with the almost complete lack of current data for production, was no doubt largely responsible for such a condition.

In the post-war period, however, a wealth of new statistical material has become available in the field of production; but critical analysis of these data—involving the measurement and elimination of long-time trend and seasonal variation—is unusually difficult. The special difficulties arise largely from the shortness of the interval for which the monthly series are available, and from the fact that industry in the post-war years has passed through a period of severe readjustment.

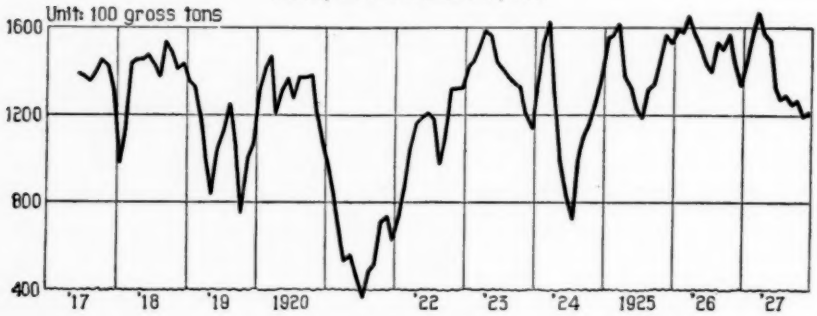
I wish to touch briefly upon some of the problems of seasonal correction as they occur in a particular industry. For this purpose I have chosen the monthly series of daily average production of steel ingots, which is available for the interval since June, 1917—a period somewhat longer than just the post-war years. Some other industry might equally well have been chosen for illustrative purposes. However, special interest attaches to the analysis of steel-ingot production, because of the importance rather generally accorded this series as one of the best single indicators of the general level of industrial activity. It shares with other production series the chief characteristic of recent years—namely, the occurrence of intermediate advances and declines difficult to distinguish from seasonal movements.

The month-by-month record of steel-ingot production from June, 1917 to date is shown on Chart I. Let us consider first some of the special factors which year by year have affected the production of steel and have left their impress clearly discernible in the graphic record. Prior to November, 1918, production of steel ingots was dominated by the demands of the allies for war materials and was maintained on an active level except for December, 1917, and the first two months in 1918, when a temporary curtailment of steel output occurred because of the fuel shortage resulting from a partial tie-up of transportation facilities. During the war years profitable private contracts were forced aside and plant additions were rushed to completion so that govern-

ment work could be handled in increasing volume. Then, with the signing of the Armistice, the industry was faced with heavy cancellations by the British, French, Italian, and United States governments and intensive production and high prices were quickly followed by small demand and declining prices. This was the situation during the first five months of 1919. The threat of a steel strike in the summer of that year brought about a temporary recovery—cut short, however, when the strike materialized in September. Although the strike continued until the following January, it probably ceased after October to exert

CHART I

AVERAGE DAILY TONNAGE OF STEEL-INGOT PRODUCTION, MONTHLY, JUNE, 1917-DECEMBER, 1927



much of an influence on production; but the coal strike in November and December of 1919 greatly retarded the normal recovery. In April, 1920, there occurred the first of a series of so-called "outlaw" strikes of railroad switchmen and yardmen. For five months both production and distribution of steel and steel products were severely hampered. Then in the closing months of the year the industry was sliding off into acute depression, and for a considerable period the normal seasonal fluctuations of output were lost in the sharp cyclical movements which followed.

By April, 1922, however, a very substantial recovery in production had taken place. Further expansion of output at that time was prevented by the bituminous and anthracite coal strikes, and in August and September steel activity was curtailed because of a strike of railroad shopmen which hampered the transportation of fuel supplies. Recovery followed promptly, and output reached record levels in the first half of 1923.

The year 1923 marked for the steel industry, as for some other industries, a period of transition. Then, for the first time, "hand-to-mouth buying" became effective, largely because of two factors

—namely, excess plant capacity coupled with highly efficient transportation facilities, and the fear, still shared by many, that prices must revert to pre-war levels.

Since 1923, the record of steel output has been one of sudden starts and stops. These movements have been intermediate in character. Production has neither fallen to such depths of depression as in 1921 nor has it been carried to feverish heights through the pyramiding of orders. These changes have occurred with such regularity year by year as to appear almost seasonal in character. Each spring has been marked by a brief period of activity followed by decline. In some years, for example 1923 and 1927, the decline has persisted during the remaining months of the year; in other years, such as 1924 and 1925, the recession has terminated in mid-summer, and recovery has characterized the second half of the year. Nineteen hundred twenty-six presents still another picture: The decline in the late spring and early summer was followed by a brief period of recovery in the autumn, which gave way, however, to renewed decline in November and December. Thus, so far as the first six months of the year are concerned, these movements have been quasi-seasonal in their recurrence each year, but, as pointed out above, the fluctuations in the last six months have been diverse.

Turning now from our consideration of these special factors which have affected steel-ingot production in the past ten years, let us consider the specific problem of measuring the normal seasonal variation. Examination of the curve of production (Chart I) fails to disclose a clear-cut picture of the probable shape of the normal seasonal, since not a single year in the entire record is free from some special factor or set of factors which has altered the month-to-month relationships. Chart II presents five sets of seasonal indexes, four for steel ingots and one for pig-iron production. These seasonals were computed by the Persons Link Relative method and calculated to the nearest whole per cent. Curve A is based on the entire period 1917–27. This 10-year period was then broken up into two intervals—the first of these including the years prior to mid-1923 when the first intermediate movement began; and the second interval, from mid-1923 to mid-1927. Thus, curve B is based on the years 1917–23, and curve C on the recession years 1923–27. Curve D, based on the period 1917–24, includes only one year more than does curve B and is presented for the purpose of showing what a marked change in the contour of the seasonal indexes is brought about by the inclusion of the first one of the intermediate movements.

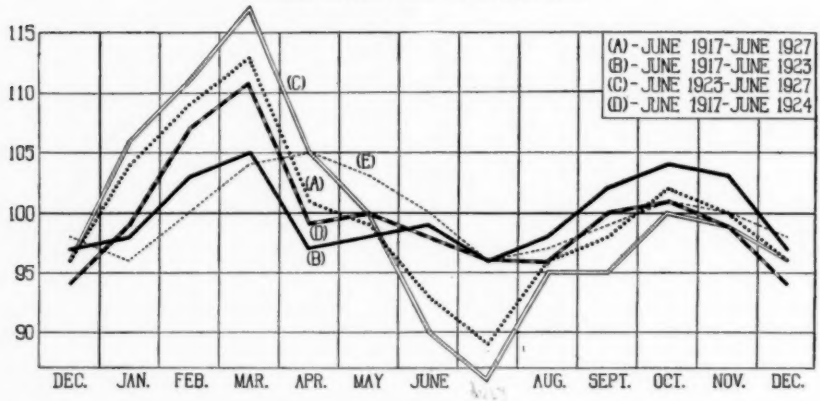
It is not primarily my purpose to present a well-defined argument in favor of any one period. On the other hand, I wish particularly to

submit for your consideration the question as to what constitutes the best measure of the normal seasonal changes in steel production. For example, shall we say that in March, the most active month of the year, steel output is 5 per cent larger than the average output for the year (curve B) or shall we say it is 17 per cent above the average (curve C)? Shall we say that in April it is 3 per cent below the 100 line or 5 per cent above it? In the period of summer let-down, most

CHART II

STEEL-INGOT OUTPUT: SEASONAL INDEXES

(Average for year = 100. Unit: 1 per cent)



marked in July, shall we assume that activity is 4 per cent below the average for the year or 14 per cent below it? Shall we decide that from the spring high point to the summer low point there is a decline of 9 points (from 105 to 96) or a decline of 31 points (from 117 to 86)? Finally, shall we conclude that the period of relaxation in the summer is followed by a period of activity in the autumn which is of about the same magnitude and duration as that which occurs in the spring, or is the autumn recovery of small importance when compared with the spring seasonal peak? In contrasting curve B with curve C, I have chosen the extreme case, to be sure, and perhaps the truth lies somewhere between the two.

It must be clear, however, that the measure of seasonal tendencies will be altered considerably if the period upon which the seasonal computation rests, includes any part of the interval since 1923. In our approach to such a problem as this we are hampered not only by the disturbed character and shortness of the interval, but also by the lack of proper technical methods. In other words, not only do we need a longer interval for study, but, with the technical methods now available

for measuring seasonal variation, it is impossible to separate the true seasonal changes from such variations as are quasi-seasonal in appearance in that they have a tendency to recur somewhat similarly each year, but the explanation of which is not to be found in seasonal conditions themselves, which are based upon such things as weather, established buying habits, and custom.

I have stated that it is not my primary purpose to defend the choice of any one particular period. There is certain evidence, however, which would favor the period 1917–23. The lighter-weight dotted line (curve E) on the chart is the measure of the normal seasonal variation of daily average output of pig iron, based on the period 1902–23. The similarity in movement between this curve and curve B, though not unexpected, is, nevertheless, striking. Because of the close integration of the iron and steel industries one might expect to find their seasonal variations in output quite similar; and the correspondence noted here serves as a partial confirmation of the 1917–23 measure of seasonal variation in steel-ingot production.

INDEX NUMBERS FOR OIL PRICES

By Joseph E. Pogue

For nine years the writer has currently prepared monthly and yearly index numbers representing the prices of crude petroleum and its principal products. The work was started as a part of a general study of prices during the War conducted by the War Industries Board under the direction of Wesley C. Mitchell. The results were first published for the years 1913–1918 in *Prices of Petroleum and Its Products*.[1] Subsequent data were given in *The Economics of Petroleum*,[2] "Production of Petroleum in 1923," [3] "Petroleum Development and Technology in 1925," [4] "Petroleum Development and Technology in 1926," [5] and the *Commerce Year Book* for 1923, 1924, 1925, and 1926.

As a basis for the index numbers, monthly average prices of representative grades of crude oil and its principal derivatives in typical markets were calculated from weekly quotations appearing in the *National Petroleum News* and the *Oil, Paint and Drug Reporter*. The averages were weighted by selection, and the following quotations were employed:

Crude petroleum at wells	5 grades and locations
Gasoline, tank wagon delivery	5 cities
Kerosene, tank wagon delivery	5 cities
Fuel oil at refineries	5 grades and locations
Lubricating oil, New York jobbing market	5 grades

From the five averages so derived, index numbers were calculated by dividing the averages for each month and year by the corresponding prices in 1913. The results are shown by years from 1913 to 1927 in Table I. The monthly figures may be found in the publications previously cited.

From his experience with these indexes, the writer offers the following critical comments on their value and practical application:

(a) The method employed in computing the index numbers is recognized as not being the best available from the view of scientific accuracy, but time is an important consideration where such indexes are maintained by an individual concerned with many other duties.

[1] Pogue and Lubin, *Prices of Petroleum and Its Products*, War Industries Board and United States Fuel Administration, Washington, 1919.

[2] Pogue, *The Economics of Petroleum*, New York, 1921, pp. 234–236.

[3] American Institute of Mining and Metallurgical Engineers, New York, 1923, pp. 25–35.

[4] *Ibid*, 1925, pp. 738–744.

[5] *Ibid*, 1926, pp. 790–793.

TABLE I

TREND OF RELATIVE PRICES OF CRUDE PETROLEUM AND ITS PRINCIPAL DERIVATIVES IN THE UNITED STATES, BY YEARS FROM 1913 TO 1927

(Prices in 1913=100)

	Crude petroleum at wells	Gasoline tank wagon	Kerosene tank wagon	Fuel oil at refinery	Lubricating oil jobbing quotations
1913	100	100	100	100	100
1914	82	83	97	85	101
1915	66	75	90	68	97
1916	117	121	101	98	119
1917	115	132	108	147	126
1918	195	139	130	189	200
1919	197	142	162	149	209
1920	302	170	217	262	318
1921	163	143	164	122	179
1922	156	140	158	117	132
1923	150	112	163	113	125
1924	161	102	162	127	149
1925	172	106	156	137	170
1926	178	112	187	138	170
1927	136	96	164	108	165

(b) In practical problems of forecasting, the index numbers have proved to be of inferior value to actual prices of individual commodities or grades; in such work, averages obscure rather than simplify.

(c) To obtain highly accurate index numbers of crude oil prices would involve very serious, if not insuperable, difficulties, because of the ever changing composition of the country's crude oil supply. The importance of the various fields contributing to the total is constantly changing; the quality of the supply is in continuous flux; and the basis of price grading by purchasing units is undergoing repeated alterations.

(d) Formerly, the index numbers of the wholesale price of gasoline at tank wagon delivery represented a relative index of both refinery realization and retail payment. Neither is the case now, since the imposition of a gasoline tax in most states and the development of widespread practice of quantity discounts.

(e) No satisfactory index of lubricating oil prices can be made from the available data, because of the relative insignificance of the spot market and the dominance of contract movements, as well as the changing character of usage. The same may be said, in less degree, of fuel oil prices.

(f) On the whole, the writer has found the index numbers of oil prices of value for comparative purposes in general economic studies, but in nearly all practical problems individual prices have been the series chosen for actual use.

CONSTRUCTING AGRICULTURAL PRICE INDEX NUMBERS

By O. C. Stine

The price index number program of the Bureau of Agricultural Economics of the United States Department of Agriculture includes the construction of index numbers of prices farmers receive for the products they sell, freight rates upon agricultural products, prices paid for farm purchases, wages and taxes, and the purchasing power per unit of farm products. I shall not undertake to describe and discuss each of these in detail, but will comment only upon a few problems that have arisen in connection with the development of this program.

One of the problems that I wish to discuss briefly is the selection of a base period. A broad base period seems to be necessary for agricultural products. Although prices of agricultural products tend to remain in a fairly stable relationship to each other over a long period, there are great fluctuations in short periods. These fluctuations are largely due to annual variations in crop yields and the marketings of livestock products. Since there are fairly definite cycles in the production of the different classes of live stock, a base period really should be long enough to include a cycle in production. We have selected a five-year base as being long enough to include hog and poultry production cycles and fairly satisfactory for establishing crop price relationships. We are still using the 1909–13 base period for the reason that we do not find any other more satisfactory base period since 1909 when our monthly prices to producers began to be collected.

Dr. Mills presented yesterday an analysis of prices which appears to me to present a good method for testing base periods. For a small group of commodities, and especially for agricultural products, the base period should be a period of price stability. Dr. Mills showed us yesterday that prices reached their highest degree of stability in the past fifty years in a comparatively short period just before the outbreak of the late War and that there has been no period of equal stability since then. His chart, however, indicates that in the last two years prices may have again reached a period of about equal stability, but we are not yet far enough away from these two years to see whether or not we are to have another five years or more of comparatively stable price relationships. I would also interpret his results as indicating that a broad base period is better than a narrow one.

We also have problems in the selection of commodities to sample adequately the field for which the index number is to be constructed. In the case of prices producers receive, we have constructed an index number of about thirty commodities from which farmers receive about 90 per cent of their revenue, but the remaining 10 per cent is not adequately represented in this index number. The groups of commodities not adequately sampled are fruits and vegetables. For many of the commodities in these groups it is very difficult to obtain an adequate price series for use in an index number. Furthermore, since the products are marketed through only short seasons in the year, they present a problem of putting in commodities for only a few months in the year. These problems are most easily solved by leaving out the commodities. We have a few fruits and vegetables in the index number, but these are not closely related to other fruits and vegetables and cannot, therefore, be considered as samples of the field.

In working upon an index number of prices that farmers pay for what they buy, we have encountered much difficulty in obtaining adequate price series and weights. The problems presented have made a real test of the resourcefulness of Mr. Purves and others who are working upon this index number. In the case of farm buildings, for example, no data as to materials used were to be had. Farm Management and Farm Organization specialists came to the aid of Mr. Purves in this matter by constructing plans for the types of buildings to be found in different sections of the country and estimating the volume and value of materials necessary to construct them. We are endeavoring to construct the best possible index out of what data are available and hope to improve both the price series and weights as time passes and more data are collected. The construction of an index number of what farmers have to pay gives rise to another interesting problem, and that is, what shall be the scope of this index number. If this is to be used in conjunction with prices of what farmers receive for what they sell as an indication of unit purchasing power of farm products, it would seem that the index number of prices farmers pay should represent all expenditures, including wages, rent and taxes. Someone, however, may prefer an index of only commodities purchased to be compared with commodities sold. A decision has to be made on this point, and no decision will completely satisfy everyone.

We have adopted the simple aggregative formula with fixed weights in the construction of index numbers of prices farmers receive and pay, but recognize the fact that no one formula will satisfy several different purposes. We are frequently confronted with the question as to the use of these index numbers as an indication of income or welfare of

farmers. Both in the construction and use of such index numbers, we must distinguish clearly between a purely price index and an index which can be used as an indication of income or welfare. By purely price index, I mean an index number any change in which measures a change in prices, not affected by a change in quantity, quality or location of commodity. From the point of view of the farmer living in one place and purchasing or selling the same thing over a long period of years, a purely price index number is significant and it is also significant to the consumer. Considering the changes in prices of products produced in a state or the country at large, a strictly price index number may not be nearly so significant as an index number weighted by current marketings or purchases, which indicates the price significance of each commodity to the extent that it is marketed. Such an index number multiplied by an index number of volume of production marketings will give a measure of change in income or expenditures. Such an index number will therefore provide a better basis for indicating the significance of prices in determining income or welfare of the farmers and many of our people consider this a more significant objective than that of determining changes in prices per unit. We are, therefore, confronted with the problem of choosing between a strictly price index number and an index number of values that can be used in conjunction with an index number of volume which will indicate gross income or expenditures. I do not believe any compromise between these two will be satisfactory. Possibly both types of index numbers should be constructed and published together.

PROBLEMS OF WEIGHTING A PRODUCTION INDEX

By Woodlief Thomas

In computing index numbers of production, weighting is an important consideration for several reasons:

(1) The number of series is usually relatively small and therefore variation in weights assigned to the different series affects the results more than if there were a larger number of series.

(2) The dispersion of the relatives is frequently wide.

(3) There is often no pronounced tendency to group around a typical central item.

(4) The individual series represent in varying degrees important industries and groups of industries.

All of these characteristics of data used in a production index indicate that the use of a median or mode is unsuitable and that a formula based upon a weighted aggregative or a weighted average of relatives provides the best form of index number for production statistics.

Recent experiences of mine in constructing production indexes provide examples of the wide differences that may be obtained from variations in weighting the individual series and also illustrate some of the factors that must be kept in mind in deriving and assigning weights.

Dr. Day and I constructed an index of the production of manufactures from census statistics, continuing one compiled several years ago by the Harvard Committee on Economic Research.[1] This index was originally computed by the methods employed by the Harvard Committee—a geometric average of relatives with base-year weights. For a number of reasons 1919 was best suited for the base year and was accordingly adopted. The weights were derived from statistics of value added by manufacture—each product was assigned to a given industry which was in turn assigned to a group. Weights were computed for each group, without regard to the degree of its representation in the index, the group weights were divided among the industries represented in the index, and these were in turn distributed among the individual products.

This computation gave for 1923 an index of 110.5 on a 1919 base, a figure so much out of line with other computations that there was reasonable doubt as to its accuracy. Examination of the procedure indicated that the difficulty lay in the use of the particular formula

[1] This new index and a detailed description of the methods used in its construction will be given in a Census Monograph, *The Growth of Manufactures*, by Edmund E. Day and Woodlief Thomas. This monograph is now in the hands of the printer.

adopted with this set of data—a geometric average of relatives with base-year weights tends to have a downward bias, to employ the term used by Professor Fisher, and that tendency was exaggerated in this case by the wide dispersion of the relatives, which ranged from 8 for shipbuilding to 220 for automobiles. The weights being based upon 1919 were large for shipbuilding with its small relative, and small, comparatively speaking, for automobiles with a large relative, thus the composite index was lowered.

The index was recomputed, using weights based upon both 1919 and 1923, *i.e.*, an average of base-year and given-year weights. There were some other changes in the index, but the revision of weights was the most dominant. This computation gave an index of 119 as compared with 110.5 first obtained.

In making these changes careful thought was given to the whole question of the logic of weighting, and at Dr. Day's suggestion, a number of additional revisions were made, giving consideration to the degree to which a specific series was in fact representative of the industries which it proposed to represent in the index and for which it was accordingly weighted. Here a distinction is drawn between the relative importance of different industries to each other and the accuracy or comprehensiveness of the statistics representing that industry. This latter problem presents itself in a variety of ways.

(1) The statistics might be inaccurate or incomplete—as, for example, the use of simplified totals to indicate changes in output of products constantly changing in complexity, such as automobiles.

(2) The products for which statistics are available may not represent production of other products classified in the same industry. One may in fact be a substitute for the other, and their output may move in different directions.

(3) To an even greater degree industries included in the index may not represent other industries in the same group. In case the industries not represented are advanced stages in output for which those represented provide basic materials—iron and steel, textile fabrics, or lumber—then the index is probably a fairly accurate picture of group changes. Where, however, this relationship does not exist then the index can hardly be said to represent the excluded industries. This occurs where grouping is based upon use rather than upon common source of raw materials—in the food, the chemicals, and the stone and clay groups, the various industries are distinctive.

(4) Some industries manufacture only finished products and are not representative of output in other industries—examples are boots and shoes, and vehicles.

(5) Some among this last set of industries might furthermore be

partially represented in the index by the output of partly manufactured products used as basic materials by these industries and again by output of the finished product. This apparently should not affect weights if they are based on value added by manufacture, but as a matter of fact such a situation is likely to distort the index, if other finished products made from these same partly manufactured products are not included, unless the weights are redistributed.

Vehicles provide an excellent example of such a case. Vehicles are made largely from metals, chiefly iron and steel, which are also used for making other products, machinery, for example. In the census index which we computed no figures for machinery are included, and machinery is represented only in the form of iron and steel, to which the weight for the machinery industries is assigned. But part of the iron and steel produced also goes into vehicles, which are elsewhere directly represented in the index. Thus the iron and steel used in vehicles appears twice, whereas that used in machinery appears only once. While the combined weight for the iron and steel, machinery, and vehicles industries as assigned is not out of line, the distribution of that weight among the products included in the index is questionable. Therefore the weight computed for vehicles was divided in half and assigned to iron and steel, which then had an importance in the index equal to that of all the industries in the iron and steel and machinery groups and one-half of that of the vehicles industries, while the finished vehicles carried the remainder of the weight as originally assigned.

The considerations (1) that the vehicles industries manufacture only finished products and are therefore not representative of other industries not included in the index, and (2) that statistics of number of cars produced or tonnage of vessels built do not adequately reflect changes in output of such complicated products as automobiles and vessels, also justified some reduction of the weights assigned to these industries.

The set of weights was then further revised on the basis of the criteria set up, the largest changes being made of course in those for vehicles and iron and steel. Recomputation of the index after these revisions gave a composite figure of 122.

The first computation with rigidly computed base-year weights gave an index for 1923 on a 1919 base of 110.5, the second with weights derived from both base-year and given-year data gave an index of 119, and the third computation with weights based upon the same data but assigned to the different industries with due regard to the representativeness of the statistics included provided an index of 122. The differences which may be thus obtained in computing index numbers for years only four years apart indicate the importance of weights and the need for observing care in deriving and assigning them to their respective series.

THE QUANTITATIVE BACKGROUND OF BUSINESS SCIENCE

By W. L. Crum

The primary aim of collegiate education in business is to develop the broad capacity for management in its most comprehensive form. Correspondingly, the science of business comprises not merely the isolated bodies of principle related to the several special business fields, but also a superstructure of principle which synthesizes these particular elements. While there exist a science of marketing, a science of finance, a science of personnel management and similar special business sciences, the science of business is vastly more than a mere sum of these; it is an integrated composite.

We are all aware that not only with respect to business science as a whole, but with respect to special elements within the science of business, there is much which needs yet to be done in the way of discovering new principles and testing those which have already been advanced. As many of the principles of business can be expressed in quantitative form, the statistical approach is likely to be particularly valuable in all researches directed to the development of this science. Statistics is a technical aid which affords a means of presenting evidence in a concise, logical, and effective form. Moreover, it affords somewhat less satisfactorily a means of interpreting, or perhaps only organizing, such evidence. In this rôle of technical aid, statistics gives us at once the quantitative apparatus for verifying and enlarging the principles of any particular element of business science, and also one of the readiest devices for applying the existing body of principle to a given practical business problem. It should be noted that this function of statistics as a technical aid appears chiefly in the several departmentalized fields of business. In each of these fields we have already the beginnings of a quantitative science. The testing of the existing principles, the establishment of new principles, and the application of existing principles to particular problems call for the wise use, in most cases, of statistical technique.

The place of statistics in the teaching of business is suggested by the foregoing considerations. Statistics is chiefly available as a technical aid in research. The statistician, to make a worthwhile contribution to business science, must not merely be familiar with the technical implement which is his specialty, but he must know enough about the particular field of business science in which he is interested so that he

can fit his quantitative analysis into the practical or theoretical problem with which he is concerned. Likewise, the specialist in one of the departmentalized fields of business science must, if he is to use the most modern tool available for his research, have a sufficient knowledge of statistics. In the teaching of business science it is therefore necessary, on the one hand, that all who are to have a real understanding of the principles of business shall have a passing acquaintance with the elementary technique of modern statistics, and, on the other hand, that statistical instruction shall be developed along lines which will fit into the entire unit of business education.

SOME SUGGESTIONS FOR THE USE OF STATISTICS IN COURSES IN BANKING

By Horace Secrist

Acting upon the suggestion of Professor Dowrie, President of the Collegiate Schools of Business, relative to the topic of the Round Table, I have selected as a basis for discussion certain banking data which might be presented and analyzed in courses in banking theory or banking practice.

The basic data are the annual ratios of gross earnings to earning assets for all member banks in the Federal Reserve System by districts and by years for the period 1919–1925. With these data, readily accessible to students, matters relating both to statistical methods and to banking theory may be illustrated.

If the average ratio for each district for the seven-year period is taken as a standard or norm, and the ratio each year for each district is expressed as a percentage deviation, the signs being taken account of, it is found that there is substantial uniformity among the various districts as to the time at which the ratios are above or below their own average levels. By presenting the data in this form, students are acquainted with the nature of an average, and with the method of calculating and expressing the deviations. Moreover, the fact that substantially all of the districts are low or high in a given year requires an explanation. The instructor and the students may consider together the occasions for this phenomenon.

But with the original data, other approaches are possible. It might be of interest to inquire as to the nature of the change from year to year in the ratios in the various districts. If the changes are computed—account being taken of the signs—it will be found that the direction of change in a given period is essentially the same in all of the districts—a matter requiring explanation in terms of banking and economic theory, and illustrating an interesting method of statistical presentation.

The inquiring mind, however, will go further and ask whether the directions of change from year to year are in any way related to the positions which the ratios in a given year occupy relative to their own seven-year average levels. Both instructor and students may answer this inquiry by the use of a simple tabular analysis, account being taken of both the position and the direction of the ratios for the respective districts and years. By treating the data in this manner, it is found that it is the ratios which were high which in the subsequent year de-

creased, and that it is those which were low which in a subsequent year increased. That is, there is a regression to type—a phenomenon requiring an explanation.

Obviously, this regression pattern may be studied further by measuring simultaneously the net amounts of change from year to year for ratios being, quantitatively, differently dispersed from their own average levels. When such an analysis is made, the interesting fact is determined that the higher the ratios above their own level, the greater the percentage amounts which they decreased from year to year; and the lower the ratios below their own level, the greater the percentage amounts which they increased from year to year. That is, so far as signs are concerned, regression to type is inverse; while by percentage amounts, it is direct. Both instructor and student at this stage of the study might well ask the question, Why? Indeed, it is this kind of a question which statistical analysis of the sort indicated raises and which banking instructors would be interested in answering.

The body of raw data used in this illustration may obviously be studied further. The ratios of gross earnings in the respective districts from year to year may be compared with those for the country as a whole. If such comparisons are made, it is found that those in certain districts are consistently below, and in others consistently above the average level. When it is remembered that gross earnings consist for the most part of discounts on loans and interest on investments, this phenomenon resolves itself primarily into a question of district differences in interest and discount rates. Why do these obtain? Are they essentially uniform? Explanations may be sought in banking history, investment opportunity, demand for and supply of banking funds, risk, etc.—topics closely related to the subject matter which the banking instructor presumably would have occasion to discuss with his class.

The variation and changes in ratios of gross earnings from year to year and from district to district may be illustrated in a variety of forms, students thus being given an opportunity to present the material graphically, to distinguish between and to interpret natural scale and ratio charts, and to observe the effects which different graphic devices produce.

There are other ways in which data of the kind used might be employed in banking courses. Among these are methods by which various series might be correlated, the bases adopted being deviations from district and country levels as well as year-to-year changes. The extent to which such methods are employed would, obviously, depend upon the wish of the instructor, his familiarity with statistical methods, and the opportunity in his course for the use of such material. I do not

presume to indicate how banking courses should be taught. My chief concern, at this time, is to illustrate in simple form the part which statistics might take in presenting and analyzing banking data, and to suggest the obvious value which such an approach would have to the student. Whatever methods of instruction are employed, the purpose of instruction is not to supply the student with a body of facts, but rather to seek to have him determine for himself the relations between facts and appropriately to express them.

A FUNDAMENTAL PROBLEM IN THE CASE METHOD OF INSTRUCTION IN STATISTICS

By Olin W. Blackett

A number of problems are faced today by those who are attempting to carry instruction in business statistics beyond the stage of the elementary course in method. In the first place, students do not learn in the elementary course, to use in a practical way, their statistical technique. This observation applies equally to students who have had a thorough preparation in mathematics and to those who have not. Conversation with other teachers has led me to conclude that the failure of elementary instruction to enable the student to apply his knowledge is confined to no one course or institution. This is not intended to be critical of such courses. It is probably impossible in the brief time allotted to them to develop in the student both a knowledge of statistical technique and skill in the application of method to concrete problems. The emphasis in an elementary course must be on the nature and calculation of statistical constants, rather than on argument from those constants. The emphasis must be on statistical description rather than on statistical inference. But if the study of statistical method in training for business is to be justified, it must be carried to the point where the student will have more than a bowing acquaintance with method and will acquire facility in drawing conclusions from quantitative data.

It is easy to suggest this and somewhat difficult to accomplish it. The faculty which needs to be developed in the student is something in the nature of a power to see analogies between a new situation and a previous experience. The mental processes involved are perhaps obscure, and no final answer possible as to the method by which this power can be developed. But certain conditions essential to its development can be pointed out. The most important of these conditions is that the original experience of the student must be vivid. Tell the student that when the relationship between associated variables is disturbed by many minor causes, a process of curve fitting or graduation is an appropriate method for describing the normal relationship between the variables. He would promptly forget it. Give him a concrete problem involving the same principle and he will remember provided that the illustration is a significant one. The original experience of the student will be vivid in proportion as it seems to the student to have a significant conclusion. At the present time, it is

the problem of instruction in business statistics to develop a large number of cases which are well classified and significant.

One other comment may be introduced here regarding the way in which statistics ties in with other fields of instruction. In courses such as those in finance, marketing, or personnel, the emphasis will be upon principle. It is not inappropriate that in such courses, cases involving quantitative data should be used to illustrate these principles. For example in personnel, a student might be given material which shows the history of an individual company's labor-turnover rates in comparison with the national rates computed by the Metropolitan or with the regional rates of organizations which coöperate with it. The student might be given other appropriate data such as the accident rates, the daily and weekly average rates of pay or other information which bears on the situation. If the student is asked to diagnose this case, he will find that the principles which he has been studying assume new interest and value.

THE OBJECTIVES OF BUSINESS STATISTICS

By Theodore H. Brown

Catalogs of various schools in the country show offerings of a variety of statistics courses. There are courses in method, courses in application to particular business problems, and courses in business cycles. Some courses require mathematics; other courses do not include mathematics in their announcement, but presumably some arithmetic is included as a necessary evil. The situation in business itself is no better, because statistics is the fad of the times. Solution of problems is attempted frequently when the conditions surrounding the problem are little understood and the methods of solution still less. On the other hand, there are some corporations with well-planned statistical organizations whose organized attack on their problems produces results of considerable material value. Possibly it is the success of these few which leads many to devious and unwise experiment. Accompanying this variety of approach in teaching method and in application there is to be found a corresponding array of texts. The variety of dishes served should enable the statistical gourmand to select a balanced as well as a tasty meal, but the food served is all of one kind and much of it is only half cooked.

In this condition, everyone seems to be trying to find by a method of "cut and try" some approach which will solve problems whose objectives are not yet clearly defined. In our problems of research oftentimes our failure to secure a satisfactory solution is directly caused by failure to formulate objectives in a sufficiently exact form. This failure to define objectives in attacking a problem distinguishes the approach of a typical college freshman from that which we hope for in the graduate student, or the novice in business from the seasoned executive. We may smile at the lady who wrote from Florida to a hardware manufacturer: "Enclosed is 25 cents; please send me a key to my trunk." But have we defined our statistical problems with any more care?

During the last two or three years several papers have appeared in which the relation of the qualitative to the quantitative approach in economic problems has been discussed. In this discussion should be included papers on the place of mathematics in statistics, because mathematics is a system of logical reasoning in regard to quantitative units. The burden of these papers has been that qualitative reasoning in economics cannot go much farther without being backed by the quantitative approach.

When the quantitative measures of business are considered, we are accustomed to think of the two great tools by means of which these quantities are obtained and interpreted. I refer to accounting and statistics. As I shall try to show later, these are not unrelated. In considering the quantitative approach to accounting and statistics, one of the things that we should like to ask is whether it is possible to organize the quantitative approach under certain laws. This immediately implies a discrimination as to what shall be included.

The objective of business statistics seems to be the determination of this group of laws, by means of which the statistical approach to a particular problem can be defined. Before the attack on this problem can be understood, there are other things which must be considered. Foremost among these is the relation of accounting to statistics.

From some points of view accounting comes before statistics. Practically, it may coincide in time with statistical work. In other words, accounting records may be gathered while statistical data are being gathered and interpreted. In addition, so far as logic is concerned, there is no reason for the clean-cut distinction that often is made either in courses of instruction or in application to business.

The probable relationship of accounting principles to statistical principles shows that there is no division in logic between accounting and statistics. Accounting principles have been described as the information which accounting records and reports should be supposed to supply in view of the determining facts of the business situation, that is, on the ultimate functional aims of accounting on purely business ends. Similarly, the statistical principles should give the information which statistical material and methods are supposed to supply in the analysis and interpretation of the facts of a business situation. From this I think it is reasonable to say that in part the fundamental principles of accounting and statistics are the same.

There is one marked difference between accounting and statistics. Within any business accounting makes its records from the raw data which the accounting department collects while statistics goes a step farther by analyzing accounting and other data. In other words, the accounting method uses primary raw data. The result of the application of accounting methods to these raw data presents the material in the form of records. It is recognized that, in some phases, accounting also deals with the interpretation of the records produced. It is believed that within this field of interpretation, the principles used in accounting are exactly the same as some of the principles used in statistics. On the other hand, within the same business, the statistical material to which statistical methods are applied consists of the records

accumulated by the accounting department, plus certain external statistical records which often are called economic statistics. These are to be considered as secondary data. In addition, statistical work may require a collection of internal statistical data—such as certain operating records or in some cases external data. These data are necessary to certain types of statistical analysis. For statistical work these are primary data. Thus it will be seen that accounting for the most part deals with primary data while statistics, which is concerned more with the interpretation of those data and less with the collection of new data, deals with secondary figures.

The result of this reasoning immediately leads us to the conclusion that the technical methods of statistics necessarily must depend upon a more complicated system of logic. The reasoning which is necessary to interpret a wide group of facts covering both internal and external figures cannot be as simple as that system which is concerned chiefly with the gathering and recording of facts internal to a given business. The system of logic which is employed usually is termed mathematics. Thus, while the technique of accounting roughly will employ arithmetic, algebra, and some elementary theory of probability; statistical method employs not only these but such things as analytics, calculus, differential equations, Fourier series, theory of probability, integral equations, complex variables, calculus of finite differences, and much more. It may be objected that these topics are only theory, but the fact is that a varied portion of each of these topics is now being used in business statistics.

Thus far no mention has been made of statistics or of accounting as applied to any particular phase of business. In fact, it is readily admitted that within a given business the interpretation of the facts of business has no departmental boundaries. This means that a problem of statistics which involves production may very well include also the purchasing and selling parts of the organization. It is likely that any given problem will cut across all of the departmental lines of organization.

That this is true as far as statistics is concerned can be seen from an inspection of the cases having a statistical background which have been published in the *Harvard Business Reports*.[1] Out of 24 cases, only one-third were acquired as statistics cases. The others were gathered as cases in marketing, or accounting, or industrial management, or transportation, or labor relations. More than this, of the cases gathered for work in connection with statistics, there are none which do not deal

[1] *Harvard Business Reports*, Vol. I, pp. 58, 67, 75, 143, 162; Vol. II, pp. 35, 56, 62, 70, 100, 120, 125, 129, 137, 149, 322; Vol. III, pp. 229, 235, 256, 444; Vol. IV, pp. 64, 100, 176, 281.

with problems related to several departments of a business organization.

Let us suppose for a moment that the principles underlying business statistics have been discovered. These principles are those of application. They probably are more difficult to discover than those of economic statistics. Reference to the published cases quoted above will give a peep into the difficulties of the problem. An executive, knowing the principles of statistics could discuss with a statistician a given problem in the light of those principles, and could leave for the statistician the carrying out of technical details. This is exactly the procedure followed in accounting practice. An executive knows that he wants to have available certain material either for an analysis or for presentation in a report. A conference with an accountant will outline the objectives desired with a view to the principles involved. The accountant then proceeds with the details. Is not the same thing true of statistics? At present are we not floundering in a morass in an attempt to sell an executive our methods of procedure when all the executive cares about is a discussion of the problem in the light of certain principles in which he has confidence? Discovery of the principles then, when placed in the hands of an executive, will enable him to discuss intelligently his particular statistical problems. Then he can leave with confidence the carrying out of the details to the technically trained statistician for he will hope confidently that the desired objectives will be reached.

To a lesser degree it will be necessary that the heads of the various departments with whom the statistician must deal in the working out of his problem understand these statistical principles. When this becomes the case, the path of the statistician will be far easier, for the information which he will obtain will be far more vital and more easily discovered. Coöperation with the various parts of an organization would thereby be materially easier.

This at once brings us to the proposition that the statistician necessarily must be a coöperator. He must be of that type under present conditions and would be no different in type under the conditions we have enumerated. The difference, however, will be that if the principles of statistics were known by the various executives of the business, coöperation with the statistician would be easier, the results would be more significant, and many problems whose solutions are now considered impossible would be solved.

If we admit then that the discovery of the fundamental principles is of primary importance and a knowledge of them desirable for effective statistical work, what should be the general conditions surrounding a course in statistics in a business school?

As far as an elementary course is concerned, I believe that a coördination with part of the accounting work if the accounting work were organized along similar lines would not only be desirable but would be inevitable. Those portions of the fundamental knowledge of the subjects which are common to both of these tools of business would be taught as parts of a coördinate whole. I believe firmly that the students would catch this significance and would be far better fitted for the problems in business than are our students of today. To show the application of the principles of statistics, sufficient method should be included so that the student could apply the principles to different problems to see how they would work out in connection with different groups of courses.

The acceptance of these ideas is equivalent to the acceptance of the ideal that a spirit of coöperation between different parts of a school organization toward an effective working out of a program is necessary. It must be admitted that this counters many of the college organizations as they are at present. Whether this is caused by the indifference of the faculty or their desire not to be disturbed in their absorption of other work is immaterial. We teach our students about the coördination of various parts of a business organization for the purpose of producing a going concern when in our own teaching work sometimes we not only prefer but demand isolated, individual treatments of business subjects which cannot be treated logically except in relation to all the other subjects.

An effect of this intense departmentalization, I verily believe, is to be found in the outlines of many so-called business statistics courses. These deal not with business but with statistical method. They are not teaching principles but details. I think it will be admitted that such courses are only slightly above the status of courses given in so-called business colleges, where operatives rather than executives are trained.

Paralleling the business situation described above in which the executive has at hand a knowledge of principles with only a moderate amount of method there would be elementary courses just described. Corresponding to the statistician who is the fully equipped technician, we would have, in addition to the elementary work, advanced courses for the teaching of technique. These would train the men who would be in charge of the carrying out of the technical details of statistical research within a given organization. Even here the philosophy of the subject matter and the assumptions made in the methods used are of primary importance. I refer to fundamental qualitative reasoning.

In this fashion, I have tried to carry you step by step through a line

of reasoning which seems to me to be fundamental to the decision of what our courses should be and how they should be organized. I believe that only by the discovery of the fundamental principles can we ever hope to do more than merely introduce one make-shift for another. I assume that we are in the habit of trying to teach our students that the approach to any business problem is through the discovery of what principles are involved and how those principles are likely to work out. Aside from the training of technicians, I assume we leave the working out of the details to others. I assume, in other words, that we are not training comptometer experts but those who will direct and coördinate the work of many such experts. If all this is true, then the principles are fundamental.

One more thing. A year ago, in his presidential address, Colonel Ayres spoke as follows:

> My primary interest is in seeking the reëstablishment of the lines of communication between two groups of statisticians, for these lines have broken down. In addition, I am concerned about building up the means of communication between the makers of statistics and the users of them, for until statistics are available they are not valuable.

I venture to remark that the makers of statistics are and will be of two groups: Those who create through research and those who know how to apply the laws discovered. This is the relation today between the research engineer or physicist and the construction engineer. The bond lies in the working laws. The bond between the makers and users of statistics lies in the laws of statistics. In either case the lines of communication are down. In fact, they never have been built. They will not be built until the principles of statistics are known and understood.

A NEW METHOD OF PRESENTING A GENERAL BUSINESS INDEX AND FORECAST

By Norman J. Silberling

The purpose of this paper is briefly to describe the construction of a general index and forecast of business activity in the United States which embodies a number of features of interest to statisticians and business executives.

Many of the indices measuring changes in business activity developed in recent years have been particularly concerned with a portrayal of the business cycle. They have pictured the deviations of commercial and industrial activity or commodity prices from "normal" base lines and in percentage or standard-deviation units. There are believed to be distinct advantages, however, in combining in a business index both the cyclical variations and the element of growth trend, which (with the seasonal pattern) forms the basis of the normal from which deviations are measured. It is also desired to show clearly the deviations from normal in percentage units, which are easily understood by the business man using such an index for planning and budgeting purposes. An index of the type to be described is particularly useful in analyzing business conditions in local areas which have diverse trends and in comparing these with each other and with the national picture.

No single series of data is believed to be as satisfactory for use in constructing a general business index as a combination of several selected series. The series used, however, should preferably reflect in a *comprehensive* manner changes in the nation's buying-power, exclusive of the security markets. This means buying-power exerted by consumers of finished goods and services, of industries, of distributors, builders, farmers, miners, railways, etc. In order to represent this, three series of monthly data have been selected—bank clearings in all cities reporting to the *Commercial and Financial Chronicle*, excluding New York; bank debits in 140 cities outside of New York; and the total car loadings of freight as reported by the American Railway Association, reduced to monthly form.

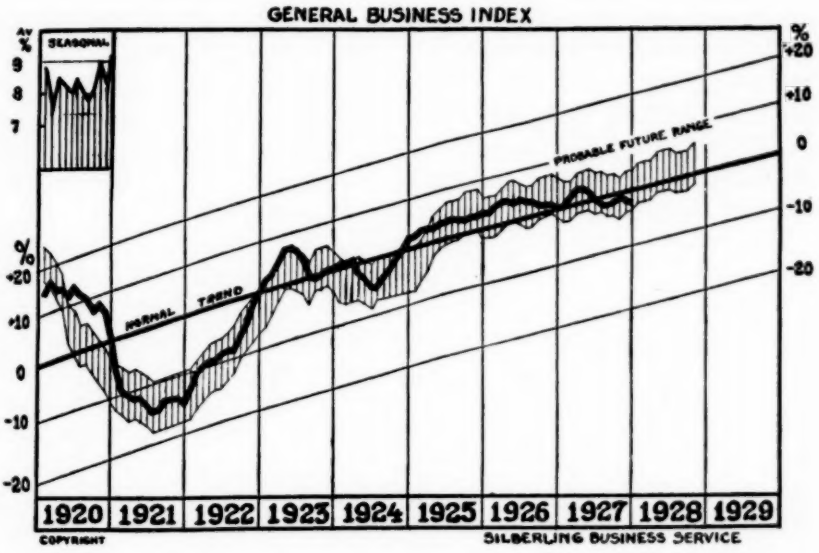
Check transactions have the advantage, for the purpose in hand, of being actual and not artificially calculated data and also of being very comprehensive and automatically weighted. While doubtless the clearings and debits even outside the great speculative center contain some elements not strictly to be interpreted as "business activity," nevertheless they do measure the flow of purchases and sales which

means commodity production and turnover and service rendered. In this way they are superior to combinations built up from numerous series which always involve distorting omissions, duplications, and errors of judgment in the matter of weights employed.

The total car loadings of freight have the advantage of representing a consistent volume series which is responsive to agricultural as well as commercial and industrial processes. The trend of this series is consistent and can be checked over a long period with somewhat similar data collected by the Interstate Commerce Commission. The monthly variations are responsive to fundamental cyclic forces because even though the total loadings are internally "weighted" on a volume basis and not in accurate accord with the values of business in the various classes of traffic, yet the classes which are heavily represented have special significance as sensitive indicators of the cycle. An experiment was made to determine whether a recombination of the several classes of freight traffic with specially determined weights would be more satisfactory than the actual total cars loaded, but with decidedly negative results.

For the purpose of measuring the growth trend of national business probably no single series will give a perfectly satisfactory result. The trend ascertained by any method whatsoever must be understood to be an approximation and subject to occasional revisions. Among the series which *a priori* would reflect the physical growth of our business transactions over a considerable period of years are clearings, railway traffic, and postal receipts. Trends were fitted (by the method of least squares) to bank clearings from 1900 to 1915, and from 1916 to 1926, inclusive. These trends were found to parallel each other, the latter being raised to a higher level through the influence of the price level change during and after the war period. The trend ascertained from the net ton-miles of freight moved, 1900 to 1926, was found to agree closely with a shorter trend fitted to the American Railway Association loadings data from 1919 to 1926, inclusive. Trends were also fitted to postal receipts in leading cities (1900–1926), to debits (1919–1926), and to number of telephones in use (1907–1926). All of these trends corroborated each other satisfactorily and it was considered possible to use as the basis of the business index trend an average of the several trends, each reduced to an index number with the 1919 point as a base. This yielded a composite trend line which has advanced from 1919, taken as 100 per cent, to approximately 140 per cent in 1927. The rate of advance was about 5 per cent per annum at the beginning of this period and is now slightly below 4 per cent per annum. This trend is shown on a ratio scale on the accompanying chart.

In order to determine the cyclical variations from month to month the same series were used and the trend and seasonal fluctuations were eliminated independently from each series. The resulting residuals, in terms of percentage deviation, were then averaged without weights. These average cyclical deviations were then applied to the trend of growth and give the business index in monthly form as shown on the chart. This is a method capable of general application and makes it possible to obtain a business index in certain cases where the trend is derived from one set of data particularly adapted to this purpose and



the cycle deviations from other data which may have a high degree of sensitiveness to cycle movements but not a trend of general significance.

On the chart lines parallel with trend indicate percentage deviation from the normal, thus expressing the range within which the cycle movements may be expected to occur. The scale for the deviations is the same as that used for the trend. In this way it is possible to present to the eye the element of gradual growth and also the *extent of deviation* from the growth element. On the usual type of index chart, with arithmetic coördinates, it is difficult to indicate the deviations as well as the growth, without excessive confusion in scales.

The index of business might, of course, be made still more realistic by reintroducing a seasonal factor derived from the constituent data. But since attention is usually concentrated on the analysis and forecasting of the *cyclical* swings, an index retaining seasonal variations

would give a somewhat complicated picture and hence the seasonal index for the average year has been separated and introduced in the upper left-hand corner of the chart. This seasonal index is based on separate seasonals derived from the clearings and debits outside of New York averaged together, and is expressed in the form of the average proportion of the year's transactions done each month. No attempt has yet been made to refine this seasonal index, or the residuals used in the construction of the general business index, by the use of daily average figures.

In order to secure a supplementary index capable of affording a *forecast* of business for the immediate future, experiments were conducted with a considerable number of series reflecting speculative and credit conditions. The data having to do with the stock market were finally discarded because, while in the pre-war period the cycles of stock prices have been shown to have value in anticipating business changes, this relationship has in recent years become so modified as to lose much of its significance and reliability for the purpose in hand.

Experiments conducted with interest rates showed better results, but only when cycles of these rates were inverted. Cyclical deviations of the rate on four to six months commercial paper, inverted, were found to precede the cycle movements in general business with fair regularity, but with occasionally serious exceptions. Since interest rates are now subject to new influences emanating from the policies of the Federal reserve system, and hence not as immediately sensitive to supply and demand factors in the short-time capital market as formerly, it was considered of advantage to go back directly to the fundamental ratio of supply to commercial demand for banking accommodation. Further experiments showed that the ratio of net demand deposits to "all other" (primarily commercial) loans and discounts of the reporting member banks supplied an exceptionally dependable series for forecasting purposes. With a projection of ten months in this ratio a correlation coefficient of +.81 was obtained with the general business curve (both expressed as deviations from trend) from 1919 to 1926.

By means of the familiar regression analysis, a prediction formula was developed whereby values of the deposit-loan ratio, projected ahead ten months, are given an amplitude corresponding to the average amplitude of the percentage deviations of the business index from normal. In other words, a calculated business index is built up from the credit ratio, available ten months before the business occurs. From the regression between the two series a standard error of 3.5 per cent is found, so that a range of this amount on either side of the values

established by the projected ratio index may be expected to include almost 70 per cent of the actual values of the business index.

The final step is to multiply the trend ordinates of the business index by the percentage deviations from trend of the projected ratios after conversion to units comparable with the business index, and to indicate a range of 3.5 per cent above and below these points. This is indicated by the band which accompanies the business index on the chart, and projects always ten months ahead of it. This presentation has the advantage of showing a definite forecast which, during the period covered by the chart, has demonstrated remarkable reliability. This can be currently interpreted as the *probable range* within which actual business activity (adjusted for seasonal variation) will very likely travel during the period ten months in advance.

SHORT-TERM FORECASTING OF GENERAL BUSINESS

By F. Ernest Richter

Each autumn the Associated Operating Companies of the Bell System draw up a very detailed budget for the year just ahead and a somewhat less detailed but comprehensive forecast for the four succeeding years. In other words, a tentative five-year program is laid down, subject to annual revision. The budget for the year just ahead takes account not only of expected operating revenues and expenses, but also of capital needs, and goes into much detail in regard also to physical units of plant. Naturally also operating officials are planning definitely in regard to personnel requirements, even though these do not appear in the budget, which relates only to financial and physical factors.

In the year 1926 the Bell System made gross additions to its plant in the neighborhood of $350,000,000 and net additions of more than $250,000,000. There was a net gain of telephones in service during the year of more than 750,000 instruments. Over the wires of the System more than 50,000,000 telephone calls a day were put through, on the average. At the close of the year just over 300,000 persons were on the payrolls of the System, in addition to some 45,000 employees of the Western Electric Company. The total plant and equipment used in furnishing telephone service stood on the books at the end of 1926 at more than $2,750,000,000.

It is for the sake of the efficient and harmonious growth and progress of an organization of this magnitude that these yearly forecasts are made in the endeavor to prepare as effectively as possible to do the best job possible in rendering telephone service in the years just ahead.

One of the earliest formal steps taken each year in carrying out the Budget Plan is the submission to the executives of the Bell System, over the signature of the Comptroller of the American Telephone and Telegraph Company, of certain economic forecasts, of which the most fundamental is a forecast of general business. In an article written about five years ago for the Bell Telephone Quarterly, Mr. C. A. Heiss, Comptroller of the American Company, wrote in part as follows about the Budget Plan:

> The Budget Plan or "Provisional Estimate" in the Bell System is a complete statistical summary of construction, operating and financial facts, both as they are presented by a pertinent period of past performance and as they may be forecast for a reasonable future period. It begins with an analysis of past

> experience and, in the light of that, searches the future and makes orderly preparation to move upon it. . . . As a preliminary step the Executives must make available a tentative program of general policies in respect of the business and its future development, so that the several departments may have a basis upon which to proceed in bringing together the material for that part of the picture for which they are immediately responsible. The Statistician must give his picture of economic and financial conditions as these may be expected with their probable effect on development; he must analyze business and labor conditions and the probable trend of interest rates and the money market. The telephone business, it is true, continues to increase with remarkable evenness year by year . . . and, in general, is by no means as much affected by external influences as . . . other business; nevertheless, economic influences cannot be disregarded and no estimate of the future of the telephone problem will be fully significant which does not incorporate the result of careful study of economic factors . . .

Each month the executives of the Bell System receive from us a *Summary of Business Conditions*, which not only reviews current economic events and developments which it is thought will be of interest and utility to the executives, but which indicates our ideas as to the immediate future of business in this country. The forecast in the *Summary* is in textual form. Our annual forecast takes the form of a graphic projection of our general business curve. This curve is, strictly speaking, primarily a curve of fluctuations in industrial activity, and as a matter of fact moves in very close consonance with the Harvard Committee's curve showing the volume of manufacturing activity in the United States. Our curve is a composite of about ten or twelve series, each of which is analyzed in more or less conventional manner to take out seasonal variation and long-time trend, with the residual fluctuation expressed in terms of standard deviation from the seasonally corrected trend.

Now, frankly, empiricism is the keynote of our forecasting work, and for it I make no apologies. Our continued use of the curve, in the first place, is due to the fact that it seems to work as a satisfactory current measure of external conditions against which to measure fluctuations in telephone traffic. In other words, fluctuations in telephone traffic, while much smaller in amplitude than those in our curve, vary well in phase with those of our curve, or should we put it the other way around? It follows that if this relationship persists, a good forecast of the curve should be of real assistance toward an intelligent forecast of telephone traffic, apart from its value as a foundation on which to base forecasts of other economic factors.

Our curve is purely a recording curve, not in any sense a forecasting curve. Indeed, some of our friends insist that it is not even a recording curve since it is a laggard. It is true that the charts brought together

by Wesley Mitchell in his new book on *Business Cycles* seem to indicate that on the whole, during the 50 years covered by the curve, it has not responded as promptly at the turns as some other curves. At the present time it is composed to the extent of 50 per cent of iron and steel and railroad figures. One critic insists that no curve so weighted down with iron and steel and railroad traffic could move promptly. The interesting thing is that it is just over the last four years that this weighting has obtained, and it is just during these four years that the curve has displayed a promptness of turning with which even its severest critics could hardly take issue. We should not want a seriously lagging curve, because telephone traffic, especially certain types of it, responds rather promptly to changing business conditions. We naturally want a curve of external business activity which synchronizes well with telephone traffic. We are fortunate, as compared with the commercial economic services, in having only one client, so to speak. If our work is of value to that one client, that is all that concerns us.

It goes without saying that in the course of the large amount of economic research which our organization has carried through, we have come upon numerous forecasting curves or so-called barometric indices. Some of these are primary or nearly primary statistics, such as zinc prices, or the well-known three months' moving average of machine tool orders. Others are composite price curves, like the Harvard sensitive price index, or Carl Snyder's index of junk prices. Still others are what may be called, with no prejudice, artificial indices, such as Lewis Haney's PV line. We place only the minimum of confidence in forecasting curves. We have not been so fortunate as to discover a single one of these curves which is an infallible guide, of the character we need, to the future movements of our curve. The economic historians of business cycles, Wesley Mitchell today or the Wesley Mitchells of future generations, may be able to point out that individual barometers have forecast with notable fidelity, or, as they may say it, have shown a high degree of correlation after allowing for the proper leads and lags, with the movements in some general business index. Apart from any intellectual objections to some of these curves, and apart from the fact that I have seen the shipwrecks of numbers of them during the past two years alone, there are two other primary difficulties in their use. The first is that even when they do make major turns, they do not forecast major turns in our curve by similar periods of time over, say, five or ten years. When they are simply on their way up or down, they are often singularly useless. In the second place, when they do turn, it is by no means certain that it is a major

turn that we are witnessing. This is especially important in a period of relative stability, such as the last two years. When our job is to forecast our curve for more than two years in advance, it is clear that for a good part of the period covered by the forecast we can expect no help whatever from any mechanical barometer, and as I have intimated, in this rapidly changing economic world of ours, there is no guarantee whatever that any one of these barometric curves will not go bad at any time.

The matter of rapidly changing worlds brings me to my next point. Just as I have little confidence for the purposes of our work in barometric indices, so I have not the courage to depend on mathematical devices, whether they be sequences, or integrals, or the results of multiple correlation, or first differences, or any other tools which I have yet come upon, to forecast such a complex phenomenon as general business conditions in as heterogeneous and rapidly growing and rapidly changing country as the United States. This is said with all due deference to the able statisticians who made such interesting presentations of some of their results at St. Louis last year. If we are dealing with a given commodity or a given industry, or even a single economic factor, such as wages or interest, and if we can be certain that it has been true in the past and will be true in the future that a very small number of forces dominates the movements in the thing that we are studying—the dependent variable, so to speak—then we may be justified in carrying through certain mathematical processes and assigning perhaps a considerable amount of importance to our purely mathematical results. It does not take a mathematician to realize that the more complicated the phenomenon with which we are dealing, and the greater the number of forces, especially intangibles, whose measurements we must make and forecast, the greater the probability of error in our final results. Incidentally, if one who is not a mathematician has any skill whatever in reading between the lines of some of the jobs that *have* been done by first-class mathematical statisticians in forecasting economic phenomena by purely mathematical means, he is driven to the conclusion that the empirical element in their work is very great; which is a polysyllabic way of saying that there is a large element of cut and try in their jobs. As long as that is the case and as long as the job of economic forecasting for the Bell System is a job of dealing with realities in an everchanging environment, why should we bow the knee before a mere group of fellow-empiricists?

For example, how many of the following events in 1927 could have been forecast by multiple correlation or by the quadrature method: The death of Model T and the birth of Model A; a bituminous coal

strike and incidentally the concomitance of weak coal prices with it; the notable change in policy of the Federal reserve system; exports of gold to England; firm or rising wages along with a marked increase in unemployment; the developments in the oil industry? Neither did we specifically forecast any of those things, to be sure. But we did try to use the best available knowledge we had and the best judgment we could muster to appraise existing conditions and forces rather than to rely on some formulae which came from an assembly line that was, so to speak, originally intended for some statistical Model T and is sought to be used to turn out a statistical Model A.

In his Presidential Address before this Association, Mr. Day divided business forecasting into three types—forecasting by analogy, by formula, and by analysis, respectively. May I suggest that the number of classes can be narrowed to two—forecasting by analogy and by analysis. Forecasting by formula clearly assumes analogy with the past, since it must of necessity be based on past experience, whether or not it is expressed in mathematical terms. It is because of our skepticism of the validity of analogy in dealing with economic phenomena that we are as skeptical as we are about the use of mathematical formulae and mechanical forecasts. We try to have our forecasting work entirely within the third of Mr. Day's categories, that of forecasting by analysis.

As we approach, each summer, the job of making the annual forecast, and each month the job of writing our *Summary of Business Conditions*, we do not therefore arm ourselves in advance with a formidable array of nice mathematical calculations. Rather we try to fortify ourselves with the most complete array possible of business and economic facts gleaned both from our reading and from our outside contacts. Our equipment, furthermore, does not include any business cycle theories; we travel very light in this regard. We cannot persuade ourselves that any of the numerous theories set forth, for example, in Mitchell's *Business Cycles*, or underlying the work of some of our present-day economic services, tells the whole story at any time or *a fortiori* for all times.

The contour of our business curve for 1923 and 1927 showed a remarkable degree of similarity for these two years. Yet how different the two years were in their precedents and in their unfolding, whether or not they shall prove to be different in their consequences. The year 1923 saw the nearest approach to a pre-war boom that we have had since 1920; and it was the climax of the recovery from the depression of 1921. Some things got rather badly jammed up in the spring of 1923. The brakes had to be applied in several directions because

business enterprises were overbidding for various things. There was not a month in the year in which gold was not imported on balance, following large imports in the preceding two years. Yet early in the year, the Federal Reserve Bank of New York raised its discount rate to 4½ per cent and kept it there during the rest of the year. The automobile industry was much more active than in 1922, and the building industry was active, stimulated by rising rents. Profits were much better, and wages and employment generally higher than in 1922.

In 1927, contrasts to many of these and to other factors and developments of 1923 could be cited. There have been shortages of nothing except Ford automobiles. Nobody bid for anything except securities and certain types of real estate. Profit margins, which were declining in 1926 for many industries, declined still further in 1927. Money has been easy and has grown easier throughout the year in spite of large gold exports in the second half of the year. No brakes have been applied even on the stock market. Employment has been steadily decreasing since the opening of the second quarter. Most fundamental of all, of course, the year has followed two years of extraordinary activity at the top of the business cycle, instead of two years of recovery from the trough of one. Forecasting the movement of our curve in the spring of each of these two years, we moved the curve gently downward throughout the remainder of each year, and our forecasts were not much in error in either year. I am afraid that whatever others might have done, the probability of error on our part would have been greater in each year, had we permitted ourselves to be dominated either by mathematical formulae or by one-cause theories of business cycles.

Our first forecast in graphic form was made in the late summer of 1921. We have made one in each subsequent summer. The following table compares for the period from the month preceding our forecast, through December of the following year, the actual average position of the curve with the forecast. The first of the two years indicated on each line in column 1 is the year in which the forecast was made.

Year	Forecast	Actual
1921–22	−10	− 11
1922–23	+ 2	+ 1
1923–24	+ 3	− 1
1924–25	0	0
1925–26	+ 3	+ 6
1926–27	− 5	+ 5
1927 (April to December)	+ 2	+1.5

The table shows that in the summer of 1926 was made the only serious error during the seven years. At that time the constructive

elements were clearly underestimated, and the elements making for business recession overestimated. Space does not permit discussion of the details of the various forecasts.

When Mr. Day asked me to give this talk, he mentioned the impossibility of doing a 100 per cent job. Certainly there is an air of fear and trembling and not one of omniscience pervading our quarters as we approach the annual forecast job each summer. Our job is both a simple one and a difficult one. It is simple in that we know exactly what we are trying to forecast and we are doing it for just one client. It is difficult in that it is so absolutely specific a job in black and white, of forecasting a relatively rapidly and violently moving curve, without the benefit of any qualifying clauses whatever, except in so far as a smooth curve does not pretend to forecast month-by-month saw-tooth fluctuations. We believe we have demonstrated to our client—a body of Bell System executives—the validity of business forecasting of this character.

Business forecasting in this country suffers less from that body of persons to whom it is all just one step removed from the medicine man than it does from some of its most ardent champions. In this it is like religion and many other things. We hear a good deal about the impatience of business men with formulae that they cannot understand but which the economic statistician is trying to put over on them. We ought to hear more than we do about the impatience of economic scientists with the unrealism of formulae and forecasting devices which are being exploited in the name of economic science, and which are utterly inadequate either to describe or to forecast general business conditions; and here I am not talking merely about mathematical formulae but about any kind. Business forecasting is an extremely inexact science, if it is a science at all. To pretend, by statements of causal relationships, simplified into the form of a syllogism or a proposition in Euclid, that it is an exact science, is to do disservice to the job.

THE NEED FOR ADEQUATE CRIMINAL STATISTICS

By Louis N. Robinson

Some twenty years ago, Professor Walter F. Willcox of Cornell University handed to me a statistical report on prisoners that had just come from the Bureau of the Census with the suggestion that I take as the subject of my doctor's dissertation the increase of crime in the United States. With some trepidation but also with that courage which comes from not knowing what dangers one is about to encounter, I started on the journey which has brought me here after this lapse of years with the task still uncompleted. Like the little girl who set out to find the pot of gold at the end of the rainbow, I seem never to arrive at my goal.

My doctor's dissertation on the increase of crime turned into a story of the attempts, by the Federal Government and by the individual states, to collect criminal statistics. It won for me the doctor's degree, that *sine qua non* of the teaching profession; and I hope, though I cannot prove it, that it has been of some little help to the cause of criminal statistics in the United States. It also started me on the trail of the criminal, a pursuit which I have continued off and on to this day.

The statistical report to which I made reference in my opening sentence, although published in 1907, pertained to the year 1904. It was a great improvement over all the previous reports of the Federal Government on prisoners, in that to the enumeration of prisoners on a certain day of the year was added an inquiry as to the number of prisoners committed during the year. Looking back over the history of criminal statistics in the United States, one wonders why it took over half a century to recognize the fact that criminal statistics belong for the most part in the class of statistics relating to a period of time instead of to a point of time. In justice to those who carried on the work of previous inquiries, we must assume that practical considerations prevented the broadening of the scope of the investigation to include the collection of figures relating to commitments.

The practice introduced in 1904 of stressing commitments instead of number found in confinement was followed in the investigation of 1910 and again in 1923. Were it not for the fact that within this period of nineteen years the practice of placing men on probation has developed with surprising rapidity, we might now be in a position to make some few rough calculations with respect to the crime movement in the United States. How much the development of probation affects the

usefulness and validity of the statistics of prisoners published by the Bureau of the Census can be seen from a study of the situation in Massachusetts and New York. At the conference last month of the National Crime Commission in Washington, Mr. Herbert C. Parsons, Deputy Commissioner and Secretary of the Massachusetts Commission on Probation said:

> Here is a state that has not built an additional cell in a quarter century. In that period she added a million and a half to her population. She has taken in diverse elements, who contribute most disproportionately to the number of offenders. Her legislatures, which still meet annually, have each year added items to the criminal cost. The automobile has arrived, loaded with offenders and contributing enormously to the facility of crime and temptation to offense. With all these contributing factors to a possible prison and jail population, she has fewer in confinement than at the opening of the century, has warrantably reduced the jail capacity, has disposed of a number of county institutions, and, in spite of a recent enthusiasm for long sentences, her state prison and two reformatories are not expanding. Coincident with the restraint upon prison growth has been the expansion of the use of probation—and explanatory as well. It has not been sporadic but constant, basing its advance on a proved security in this reliance. In the most recent year of completed record there were 11,340 commitments to institutions and 30,934 persons placed on probation in the state. This morning 6,500 persons awoke in cells or prison camps; 20,000 persons are today in the care and under the control of probation officers. In 1926 out of 1,000 convicted offenders, 84 were committed to institutions and 227 were placed on probation. The remainder were disposed of by the payment of fine or the filing of their cases without penalty. In the year, two million dollars were collected from persons on probation for the benefit of their families, restitution to persons injured by the offense and in the form of fines under suspended sentence—fully five times the total cost of the service.[1]

The New York Crime Commission found that 29 per cent of those convicted of felony in New York State were given suspended sentence.[2] The lowest per cent mentioned, 12.71, was for the city of Albany and the highest, 43.09, was for "rural upstate," a territory not included in the other classifications used by the Crime Commission, the lowest of which covered cities and incorporated villages with a population of from 5,000 to 100,000. In addition to the number who through probation are now escaping the statistical net spread at the prisons, there has always been a great group of convicted offenders who never were enumerated. I refer to those who were fined and paid their fines. How great this number is it is hard to say. We note that of those committed to prison during the year 1923, 47 per cent or nearly one-half the total

[1] A full *Report of the Proceedings of the National Conference on the Reduction of Crime*, called by the National Crime Commission, November 2 and 3, 1927, p. 133.

[2] *A Statistical Analysis of the Criminal Cases in the Courts of the State of New York for the Year 1925*, by the Sub-Commission on Statistics, p. 27.

number were committed for the non-payment of a fine. Some calculations which I have been making recently lead me to believe that this number sent to prison for the non-payment of fines, although nearly one-half the total number committed to prison is but about 8 per cent of the total number whose sentences were a fine only.

We see, therefore, how inadequate statistics based on commitments to institutions are. I do not wish to imply that they are valueless and that we could dispense with their collection. They furnish us much information, partial it is true, on various aspects of the crime problem. Then, too, they are practically all that we have, and I believe they constitute a kind of a toe-hold that will enable us to climb to higher forms of criminal statistics in the future. Consequently, I welcome gladly the effort that is now being made to collect statistics annually from the state prisons and state reformatories for adults. This new venture of the present year deserves our hearty support. Let us pray for its success and further growth. May the time soon come when the Bureau of the Census will present us yearly with a report on the statistics of prisoners covering all the penal and correctional institutions in the country.

For the reason stated, namely, the incompleteness of the returns, we must not be content with this slight improvement in prison statistics. This is not the only reason as I shall endeavor to set forth, but it alone is a powerful and a sufficient reason why we must push our inquiries in other directions, set our statistical nets as it were in other waters to catch the fish that now escape.

Were it not for certain upheavals and movements that are now taking place in the various states, I would be utterly discouraged over the outlook. Certainly there is nothing very encouraging in the history of criminal statistics during the last twenty-three years. If progress in the future is to be at the same rate of speed as in the past, we who are gathered here today and our children's children will all be dead and gone, perhaps swept away by recurrent crime waves, before we have the kind of criminal statistics which plain common sense now dictates we should have. The thing, however, which gives me hope is the present large public discontent with the whole machinery of criminal justice including the police, the courts, the prisons and the parole and probation agencies. Something good for criminal statistics may come out of all this, particularly so, if those of us who are interested in the sociological side of criminality will join forces with those who are seeking to develop efficiency in the agencies of criminal justice.

This public discontent has, as we know, crystallized in many states and cities into crime commissions, intent on doing something, often

they know not what, to improve the work of those agencies which society has set up to protect itself from the depredations of criminals. Usually these commissions have found out, before they progressed very far in their endeavors, that facts were essential—facts as to the number of crimes committed, facts as to the number of arrests made, facts as to cases heard by justices of the peace or police magistrates, facts as to number of cases thrown out for one reason or another by public prosecutors and by grand juries, and facts about cases tried in courts of record and courts of appeal, facts about probation and parole, and facts finally concerning recidivism. In short, these crime commissions found out rather quickly that they could not get along without criminal statistics.

Frankly I do not believe that the enlightenment of the various crime commissions can be traced either to statisticians or to criminologists. Many business men are serving on these commissions, and the idea of complete reports from each operating unit is not at all new to them. At any rate, for the first time, so far as my memory goes, we find groups of influential citizens demanding that the agencies of criminal justice show in black and white what they are doing. This, I repeat, is only in line with good business practice which makes an accounting of all business activity a daily requirement.

It seems to me now that many of us have been too narrow in our claims as to the value of criminal statistics. As criminologists, as sociologists, and as statisticians we have argued for the development of criminal statistics. Making our appeal as scientists, I do not believe, however, that we are going to get very far. No set of legislators will be willing to appropriate the large sums of money which will be necessary to set up adequate systems of accounting in the field of criminal justice simply to enable a number of scientists, however honorable or learned they may be, to write treatises on the causes of crime, or the genesis of crime or on the nature of criminals or the why and the wherefore of criminal activity. I do think, however, that legislators can now be interested in criminal statistics providing the matter can be presented to them in some such way as I have indicated, that is, as a bit of ordinary business technique for maintaining control and direction of operating units.

I see little or no ground for conflict between the scientists and the groups who are now demanding criminal statistics as a means of securing greater efficiency in the administration of criminal justice. Scientists have all along assumed that the results of their analyses of criminal statistics would at least indirectly prove of interest and of value to legislators. I do not, however, think that scientists have in the past

quite sensed the fact that criminal statistics in addition to furnishing the basis for new legislation were also fully as important as a means of checking up the administrative work of governmental agencies dealing with criminals. Conceivably more facts will be needed to satisfy the two groups of scientists and of individuals intent on securing a fair degree of administrative efficiency, than would be necessary to satisfy either one of them, but to a large extent the same set, or sets of fact, will be used by both.

However, one matter of detail may be the source of some difficulty in the organization of the statistical work. In some of the states, there is now a tendency to make the collection of criminal statistics a part of the work of a bureau of criminal identification. This is, of course, a move on the part of those interested in the efficiency of the machinery of criminal justice. I am not at all convinced as to the wisdom of this. A bureau of criminal identification belongs within the police organization and the collection and interpretation of criminal statistics should be entirely free from the influences of any one branch of the administration of criminal justice. State departments of welfare and of justice will undoubtedly, as the movement grows, each make a bid for the bureau of criminal statistics, and we will probably see the bureau placed now here and now there as the conflicting forces within each state may decide. I do not know that it matters much providing the independence of the bureau be insured and a capable statistician be hired to direct the work of gathering and interpreting the facts.

As a criminologist, may I now point out how the criminal has once again promoted progress. By his recent activity, he has shown up the stupidity of the police, the incompetency of the courts and the utter ineffectualness of our penal and reformatory system. He has in many of the states and cities compelled the powers that rule to demand an accounting from the police, the courts and the institutions and agencies dealing with offenders. He has given more impetus in the last five years to the movement for the collection of criminal statistics than we have been able to generate within the last seventy-five.

THE PROBLEM OF COLLECTING AND STANDARDIZING STATISTICS OF CRIME IN FORTY-EIGHT SOVEREIGN STATES

By Leon E. Truesdell

Statistics of some sort relating to crime or criminals have been collected by the Bureau of the Census in connection with each decennial census since 1850. In 1880 inquiries were planned to cover not only prison population and commitments but court proceedings and police records as well, though only the prison population data and incomplete results of the police inquiry were ever published. From 1850 to 1890, therefore, the available statistics include little more than the prison population, and even these figures involve considerable variations in definition. For the year 1904 there was taken what might be termed the first of the special censuses of penal institutions, covering not only prison population but commitments and discharges as well, all classified in considerable detail. Similar and comparable figures are available for 1910 and for 1923. These three inquiries covered state and Federal prisons and reformatories, county and municipal jails and workhouses, and juvenile reformatories.

The Census Bureau is now engaged in the first of a series of proposed annual censuses of state and Federal prisons and reformatories, schedules for the year 1926 having been received for 96 out of a total of 99 institutions. For use in connection with this annual census, the Bureau issued about a year ago a manual of criminal statistics, which contained, in addition to the necessary instructions for the reports from the prisons and reformatories, a series of suggested outlines for statistics to be compiled by or for other agencies, including police departments, courts, prosecutors, and parole and probation agencies. These brief suggestions, it was hoped, might contribute in some measure to the standardization of records and reports in the field of statistics of crime, or at least form the starting point for more effective methods of standardization.

In 1907 the Bureau undertook a more pretentious piece of statistical investigation, collecting criminal-judicial statistics from the records of 1,557 criminal courts, in 249 counties, covering 320,765 cases which appeared on the dockets of these courts during 1906. After the material had been collected and tabulated, and the report not only written but put in type, so many faults and shortcomings appeared that the report was never published. Some of these faults were the result, doubtless, of the way the work was handled in the Bureau, especially of

the fact that it was passed along from one person to another, so to speak, for supervision, rather than being continuously in charge of one person permanently interested in its completion and competent to settle wisely in advance such questions as should arise with regard to classification, definition, etc.

To a very great extent, however, the weaknesses of the final report grew out of difficulties and obstacles inherent in the material of the investigation itself. The classifications could not be made consistent, because the terminology employed by the courts in different states was not consistent; the descriptive matter could not be made complete, because the court records themselves were not complete; the groupings of crimes could not be made uniform, because the records were ambiguous and lacking in incidental details on the basis of which the proper assignment of cases could be made; the classification according to type of court could not be made satisfactory, because of the widely differing forms of court organization in the several states. In particular was there difficulty in classifying both crimes and punishments, by reason of diversity in the state laws.

The fact that the inquiry covered only a part of the country, and that part an area arbitrarily chosen, was recognized in some of the later correspondence relative to the report as taking away from the investigation much of its positive statistical value, leaving the results mainly significant as an experiment in the field of criminal-judicial statistics. This experimental value was judged not sufficient to justify the publication of the report.

Quantitatively, then, the Bureau of the Census has produced a respectable volume of criminal statistics; and qualitatively it may claim credit at least for the last three investigations of prison population, commitments, and discharges (those of 1904, 1910, and 1923), and for the annual inquiry which is now under way.

The limitation of the satisfactory census statistics to those of prisons may be partly the result of historical accident, which directed attention to the collection of data with regard to the population of institutions of all types. To some extent, however, it is the result of a more fundamental fact, namely, that in the records of the penal institutions the raw material for statistics was found in more readily usable form than in the other records from which such material has been sought.

Again—and this is another factor of fundamental import—the facts set forth in the prison records were simpler and more definite than most of the others. A man is committed to prison on a certain date, for a certain crime, under a specific sentence, remains a certain time and is discharged on another certain date. By contrast, a case entered on a

court docket may travel any one of a dozen paths before it is finally disposed of, many of which admit of vague and indefinite recordings and present unexpected combinations.

The census prison statistics, then, granting that prison data alone are inadequate, represent at least a solid foundation for a more pretentious system of criminal statistics.

If we are to consider the extension of our work in criminal statistics for the nation as a whole, we naturally look for suggestions to the records of other countries which have carried this type of work farther than we have done.

In the preface to the 1925 report of the Canadian Bureau of Statistics on the subject of *Criminal Statistics*, I find a few brief lines which are so full of suggestion for our own present situation that I cannot refrain from quoting them. They represent two sections from the law under which the Canadian Statistics are collected, and read as follows.

> Section 29. The clerk of every court or tribunal administering criminal justice, or in case of there being no clerk, the judge or other functionary presiding over such court or tribunal, shall, before the end of October in each year, fill up and transmit to the Dominion Statistician, for the year ending the thirtieth day of September preceding, such schedules as he receives from time to time from the Dominion Statistician relating to the criminal business transacted in such court or tribunal.
>
> Section 31. Every person required to transmit any such schedules shall from day to day make and keep entries and records of the particulars to be comprised in such schedules.

The eloquent irony of these brief sentences, for us in the United States, may not appeal to those of you who have not wrestled with the problems growing out of the diversity of laws and conditions and practices in the 48 sovereign states making up our Union. For those of you who have had such experience, it is unnecessary to speak further.

Notice, in particular, the mandate of section 31. Not only must the court clerks and others concerned fill out the schedules submitted by the Dominion Statistician, within 31 days of the close of the record year, but "from day to day" throughout that year they must keep records of the "particulars to be comprised in such schedules."

Laws of this kind are not for us, however, and we must seek such results as we may through less direct methods.

It is worth while, then, to examine the precedents in our own experience. The oldest example of arrangements under which statistics obtained from state sources have been regularly collected and standardized by a Federal agency, is that of the mortality statistics gathered by the Census Bureau. Beginning in 1900, with ten states, represent-

ing about 40 per cent of the population of the country, as a registration area, and limited to these states because none of the others had adequate laws requiring the registration of deaths, the area from which satisfactory data are obtained has been expanded until it now includes 43 states and 11 cities, containing 93.5 per cent of the population. The expansion has been accomplished through persuading state after state to adopt a so-called model law, providing for the registration of deaths, with information on the cause of death and on the various other items required for the standard mortality tables.

The birth-registration area, started in 1915, has been expanded in the same way until it now includes 41 states and about 90 per cent of the population.

Statistics of divorce have been obtained annually since 1922, these figures now coming from centralized state agencies in 12 states and direct from the county clerks or other officials in the remaining states. Since a divorce results from court action, it naturally leaves some kind of a record, so that it has not been necessary to wait until state legislation provided adequate records, as in the case of deaths and births, before proceeding with the collection of statistics for the country as a whole. The whole number of divorces is relatively small (about 180,000 in 1926), and the number of items of information required for their significant classification is small, so that it is possible, at an annual cost of considerably less than $20,000, to collect the information from nearly 2,500 separate county or court sources.

In similar fashion we collect the mere number of marriages performed each year, without classification of any sort. If we should try to obtain even a few items of information about each marriage, such as the color of the parties, their age, their previous marital condition, or their occupation, we should immediately meet with difficulties similar (only less serious) to those which confronted the criminal-judicial investigators in 1907. The specific information with regard to the parties to a marriage might be expected to come from the marriage license, which is a matter of some sort of record in all states. But these licenses are of 49 different varieties, counting the form used in the District of Columbia as the 49th. Only a part of them show the color of the parties, important as that item would be for any state having a considerable Negro population; only a part show the age; and only a part show such an important matter as the previous marital condition. A really satisfactory census of marriages, then, must expect to begin as the mortality reports began, with a limited number of states forming a "registration area." Because of the few questions which even the most enthusiastic advocate of detailed marriage statistics could possibly wish to ask

about each marriage, however, the program for such an inquiry would be relatively simple and easy to formulate.

With this review of the precedents, let us return to the problem of criminal statistics. The bulk of the statistics in the Canadian report, to which reference has already been made, are based on information received from the courts. The tables in this report show not only the disposition of the cases in the courts, but also a considerable variety of information with regard to the persons convicted, including sex, age, marital condition, place of birth, educational status, and religious affiliation.

Without doubt, if adequate reports could be obtained from the courts, these would furnish the most significant single source of criminal statistics. Let us consider, then, how the problem of obtaining such reports compares with the problems which are already being solved, at least after a fashion, by the Census Bureau. In the first place, a crime is a very indefinite, and even elusive thing, as compared with a death or a birth, or even a marriage or a divorce. Deaths and births are physical facts, sometimes unrecorded and largely unnoticed, to be sure, but definitely existing, and only rarely accompanied by any motive or desire for their concealment. A crime, on the other hand, is an intangible act, given its very existence as a crime by statute or common law. Probably more than half the arrests made in the United States last year were for crimes or offenses which 20 years ago were not unlawful acts. Further, there is strong incentive for the concealment of crimes, whenever they are of such nature that concealment is possible.

The causes of death have been classified by a group of physicians acting in international concert, on the basis of the physical characteristics of disease and of the human body. Can we imagine an international classification of crimes? Even the preparation of an interstate list, which shall be reasonably consistent and reasonably detailed presents problems which we are so far only beginning to solve.

With the criminal court cases, as with the divorces, there is, to be sure, some existing record in every state. To this extent the problem is easier than that of the death registration, where, in the beginning, there were no records at all. But the court records have very few items in common, beyond those necessary to trace the progress of the cases through the judicial system.[1] If we wished to obtain from the court records even the brief series of personal items that are presented in the Canadian reports, therefore, it would be necessary to secure material additions to the records now kept. And since we are not at all likely to

[1] It was for this reason that the suggestions for court statistics contained in the *Manual* issued by the Bureau of the Census a year ago were limited to the record of judicial progress.

have the benefit of a blanket statute requiring the court clerks to keep such records as may be necessary to furnish information annually demanded by the central statistical office, we must have recourse to something like the model-law plan followed in the death and birth registration campaign. Further—and this is most important—since the model law must specify the essential records in detail, we must first know exactly what items of information are essential. This we are a long way from being agreed upon at the present time.

Before the Census Bureau can well make any material expansion in its present program of annual statistics of crime, which is now limited to prisoners in state penal institutions and their commitments and discharges, it will be necessary to have a specific authorization from Congress. The present limited inquiry is being undertaken, under a general law, as a sort of experiment. And it seems appropriate that the measures necessary to secure the passage of a law providing for more extensive annual statistics of crime should be taken by those organizations which are interested in obtaining the statistics, rather than by the Bureau, which might be accused of seeking expansion merely for the sake of expansion.

Granted, however, that adequate authorization and adequate appropriation for a more extensive program were secured, what ought to be the next step?

The first thing, perhaps, would be to expand the scope of the annual institutional inquiry to include jails and workhouses as well as prisons and reformatories, putting it on a par with the so-called decennial inquiries of the immediate past, with the addition, perhaps, of data on paroles from these institutions. That would be simply to round out one group of criminal statistics, however, and would not be enough.

Suppose we were to plan for court statistics of the type published by our neighbors on the North. Then, since we are 48 states rather than one Dominion, we must either proceed to obtain uniform state legislation providing for the information required, or we must work out a scheme for translating the present diverse official records into a uniform terminology, with the assistance of such supplementary records as we might persuade the court clerks and others concerned with the records, to keep. Under such a scheme our statistical program would necessarily be limited by the available material; but it might be better to make the start in this manner for the sake of getting the project under way in a relatively short time.

Whatever general plan be adopted, the first step should be to make a careful survey of the field and a detailed plan for the specific inquiry contemplated. I believe this could best be done by assigning to the

task some very competent and fairly enthusiastic man with both experience and judgment, especially with judgment as to what could *not* be expected of court clerks and other essential furnishers of statistical material. This man ought to be both a good research man and a good organizer, but he should by all means be a good research man. For many months, perhaps, he would find it profitable to work with no assistants beyond a secretary, so the problems of organization would not at the start be in the foreground.[1]

Having determined, within the limits of reasonable practicability, what information it was advisable to try to collect, we might then classify the states into groups, starting with those whose present records were adequate (if there were such), and ending with those whose court records would need to be entirely remade before they could be admitted without reservations to the judicial "registration area"; and either a model law could be devised for the reorganization of the court record systems of the remaining states, or such intermediate measures could be taken as circumstances seemed to justify.

Even a year spent in preliminary research and planning might seem to some eager enthusiasts like time wasted. They might cry, give us results, and that quickly. But suppose a model law were drafted by a three-day conference of such enthusiasts; suppose that law were lobbied through the legislatures of a dozen states; and then suppose it were found that its provisions were not adequate, or that its requirements required the impossible or impracticable? How much extra effort would be needed to re-persuade the legislatures of these 12 states to pass a new and remodeled model law? And how many years of effort and expense in collecting statistics that did not "fit," did not serve the purpose, would actually be wasted?

It is true that since the Census officials finally passed the unfavorable verdict on the results of the criminal-judicial inquiry of 1907, much good work has been done in the field of criminal statistics. There are the reports of state and local crime commissions; there are some excellent reports of state offices; and there are private studies of crime and its significance, so that our proposed investigator would find a wealth of material ready at hand. In the matter of standardization, however, and to find out how far any tentative standard could be applied in the different states, I believe he would have to go mainly to original sources. And the backbone of any adequate national compilation of criminal statistics is just this matter of standardization.

[1] This recommendation is taken in the main from an unpublished memorandum on the 1907 criminal-judicial inquiry, prepared by Mr. Lewis Meriam, which contains many other excellent suggestions with regard to methods that might well be adopted in case another similar inquiry were undertaken.

I have spoken just now of the problem of obtaining court statistics as if that were the obvious task to undertake next. That may not be. But if we substitute police statistics, or data from any other source-group, the requirements of the case will be somewhat the same. We shall be confronted with a wide variety in the form of our raw material, as it now exists; with the necessity for establishing standards, and then getting them adopted. This, it seems to me, is the most important single problem connected with the task of expanding our criminal statistics in any direction. And I am sure you will agree that this task ought to be undertaken with great deliberation, and in the light of adequate and competent research, so that when the standards are promulgated, they may stand the test of continued use.

CRIME STATISTICS AS A POLICE PROBLEM

By Lent D. Upson

The correctness of the numerous opinions concerning the hereditary, physical, social and economic causes of crime, can only be determined by the most careful analysis of criminals and potential criminals. Such analysis can take place at three different points—at the time of the arrest, at the trial, and at the incarceration.

But of ten men arrested by the police, only three will reach the courts, and only one a correctional institution. Here is the first problem in crime statistics for the police.

Eventually a psychiatrist and social worker may be found in every police station. Until such case study under experts can be undertaken, the arrest record must continue to be a simple summary of very obvious physical and social data, which ordinary patrolmen can secure with a minimum of effort. Here we can find the prisoner's sex, age, race, education, social condition, employment, etc. These data are valuable when taken in the mass and when studied. For example, in Detroit we are just concluding an examination of 200,000 arrests. As a result we shall know something about the amount and character of offenses committed by different races, the ages at which offenders commit these offenses, the effect of domestic conditions upon the commission of offenses, as well as the part played by an absence of familiarity with a skilled trade.

But before such arrest records are of comparative value the police must agree among themselves upon a uniform nomenclature with respect to misdemeanant offenses, uniformity of definition with respect to racial origins, and uniformity of classification of trades. Further, there must be some uniformity of charge when persons are held for investigation. In former years, Detroit has arrested many thousands of suspicious persons and charged them with "robbery, armed," while under investigation. In Cleveland, no charge is preferred, the record reading "held for investigation." Unless the arrest record can be made really informative, it can be of little benefit to the authorities in the solution of police problems.

The arrest record along with reports of complaints committed, or "crimes known to the police" as they are commonly called, provides a foundation for a study of the crime hazards of each police district. Crime hazards—by which are meant poolrooms, blind pigs, near-beer saloons, turkish baths, coffee houses, certain types of apartment houses,

and certain classes of residences—vary materially in different sections of the city. The presence of such hazards can only be checked by consideration of the arrests and complaints in different areas. For example, the addition of another home to a city is not necessarily an addition to the burglary hazard; some homes are so poor that no burglar in his right mind would be attracted. On the other hand, there are sections of the city in which burglaries may be expected and the type and amount of police protection must be determined by the number of complaints received. It might be expected that the police would constantly utilize these data for the correction of patrol beats, the location of stations, the size of districts, and strength of force. Such is not always the case.

In communities of slow growth the precinct stations may have been located at a time when policing was done on rubber heels rather than on rubber tires, and the consolidation of districts is difficult. Besides, in a military organization precedents account for much. What has been done continues to be done unless modified by a superior who may never be in a position to know about it.

The police have never felt the outside pressure for improvement that has been placed upon their uniformed brethren in the fire department. The National Board of Fire Underwriters periodically surveys the fire departments of American municipalities, points out shortcomings in organization and procedure, and lack of personnel and equipment. The penalty for failure to accept the recommendations made is increased insurance rates, or failure to secure reduced rates. It is doubtful whether the volume of theft insurance will ever become sufficiently large to warrant the underwriters injecting themselves into police administration as thoroughly as they do into fire fighting.

Aside from arrest data and an enumeration of kinds and causes of crime hazards, the enumeration of the offenses known to the police has the greatest bearing on the problem of crime cause and prevention. Neither the public nor the authorities responsible for curbing offenses have any usable knowledge of the number and character of crimes committed or of the cost of these depredations. The facts—when records exist at all—lie buried in the "squeal books," the records of complaints or of "offenses known to the police" in the villages, cities, towns and counties of the several states. Which means, as Mr. Rutledge put it, that "we are in the absurd position of endeavoring to diagnose and cure a social disease, or, better, several different social diseases, because crimes are of differing types and spring from different motives, without knowing how extensive those ailments are, where they exist, and the effect of current remedies."

The total number and type of offenses against law and order can never be known precisely because they are not all reported to the police. Usable totals and details will be known only when all governmental units report complaints of offenses to some central state authority, such as the State Bureau of Criminal Identification and Records proposed recently for New York. Even then, it will be necessary to agree upon some uniformity of definitions and procedure of recording before these data can be used comparatively. And it will be years before the concerted efforts of interested groups will result in such uniformity and completeness of reporting, if the experience of the health authorities in expanding the state registration areas for communicable diseases is any criterion.

In the meantime, it is possible for the police to make available to the public the amount and nature of crime committed in larger cities, say those of over 30,000 population, where probably most crime takes place. The International Association of Chiefs of Police has occasionally resolved that such information should be secured, but slight progress has been made. However, with a view to stimulating further activity in this direction, Commissioner Rutledge recently sent questionnaires to some 300 cities, defining certain major offenses, and requesting data as to their incidence for the year 1926. Returns from 100 cities were reported to the Windsor Convention. It is almost useless to say how unsatisfactory the material was for comparative purposes, thereby emphasizing the necessity for uniformity and completeness in reporting.

For example, the most important crime that can be committed in civil life is that of murder. Because the common law definition of this crime has been so frequently changed by statute law, the questionnaire asked for the total of homicides, exclusive of justifiable killings and killing by means of an automobile. The rate ranged from over 25 to zero per 100,000 population, a variation so large as to compel doubt either of the definition or of the records. The questionnaire asked for the number of robberies on highways, *i. e.*, "hold-ups" and those in buildings except as burglary, *i. e.*, bank and store robberies. In some instances the returns are made as one, and in others there is an indication of confusion with breaking and entering.

The returns on burglary, separately for residences and business places, are, of course, confused by the large differences in the statutory definitions of these crimes. For example, in California burglary may be committed at any time of the day or night in almost any type of building. In Michigan, burglary can be committed only at night. In some jurisdictions breaking and entering a freight car is classed as burglary; in others it is not.

The greatest lack of uniformity exists in the returns for grand larceny. This was defined as theft from a store, dwelling, bank, office, warehouse, etc., in an amount over $25, not by violence (which would be a hold-up) and not by burglary. There is ample reason for this discrepancy. In one jurisdiction it is grand larceny to steal an article valued at $15, or over, and from that figure the minimum moves from $20 to $25, $30 to $35, to $50 and then to $200. In California, a theft must be of over $200 in value to fall in this class, but any theft of live stock is so considered. Similarly, in Florida, it is, or at least has been, a felony to steal a hog. Each state has its own pet felonies depending upon local social and economic conditions.

Larceny from the person in the nature of pocket-picking was enumerated separately. From the returns it is very evident that what is considered grand larceny in one jurisdiction is not so considered in another.

Even in reporting the theft of motor vehicles a great variation arises because of conflicting procedure. This results because in some jurisdictions the police do not consider a motor car stolen until it has been lost from 24 to 48 hours. This rule is utilized to eliminate thefts reported by absent-minded gentry who forget where they have parked their vehicles, the cars that have been borrowed without permission by friends, and those taken for brief joy-rides. It does seem desirable to have the report of automobile thefts limited to those cars that have been stolen for the personal use of the thief or to be disposed of by sale. But this difference in police procedure may have something to do with a city like Baltimore reporting the loss of only 30 cars per 100,000 of population, or Jersey City 68 cars, when Toledo reports 1,013 and Cincinnati 822. And, of course, for comparative purposes these thefts should be measured as a ratio of cars registered and thus available to be stolen, instead of on a population basis.

Such variations in procedure now render comparison difficult even when there is uniformity in definition. For example, if an offender breaks into an apartment house and robs a dozen apartments, is that twelve burglaries, or one? What distinction will be made between such robberies in an apartment house and in a rooming house? The statutory definition of burglary may be the same in two jurisdictions and the procedure of enumerating the complaint entirely different.

Of less importance, but still a problem, in recording crime statistics, is the enumeration of crimes committed in the perpetration of a major crime. Shall Los Angeles record both a kidnapping and a homicide in the Hickman case? What shall be the record in a recent Detroit case in which an offender, who was speeding and driving while drunk, ran away from the scene of an accident after killing two persons? If

freed on the last charge, he will doubtlessly be prosecuted on one of the others.

As a result of presenting this confusion to the chiefs of police, by Commissioner Rutledge, the International Association of Chiefs of Police authorized the appointment of a committee to undertake a program of uniform reporting. As Chairman, Commissioner Rutledge has outlined work comprehending the following steps:

1. Preparation and acceptance by the Association of uniform definitions of major offenses so far as consonant with differing laws. Since arbitrary definitions of offenses cannot be made, owing to the variation in statutory definitions, it is proposed to arrange a classification and segregation of offenses, so as to arrive at substantially uniform results. For example, one state may define burglary as breaking and entering either in the day time or night time. Another state may define the offense as breaking and entering only in the night time. With a proper segregation of offenses, the comparative data can be made uniform in spite of legal differences.
2. The development and general acceptance of a uniform procedure for handling complaints so that each department will record the same defined offenses in the same manner. For example, in recording several thefts committed in a multiple dwelling one department may now treat each particular offense as a separate burglary, while others would record the several offenses as a single burglary.
3. Encouragement to police departments to maintain records in accordance with the agreed definitions and classifications so that comparative periodic reports may be prepared.
4. The eventual development of a clearing house for crime data, possibly in connection with the Bureau of Criminal Identification now connected with the Department of Justice at Washington. It is assumed that it will be necessary for only the more important cities of the country to utilize this clearing house, say, beginning with cities over 30,000, although this population limit can be constantly lowered. This is not meant to prevent any city reporting now that wishes to.
5. Determination for each year of the reportable estimated population of cities for use as basis for showing the number of offenses per 100,000. At the present time the population statistics used by the police authorities vary considerably from those reported by the United States Census Bureau for interim periods.
6. Eventually, the development of state bureaus of criminal identification and records. A number of states already have bureaus of criminal identification and these might be expanded to include record keeping for minor divisions of the state. In this way each state would be in a position to make available a total of all offenses committed within its jurisdiction. For the clearing house at Washington to assume this responsibility would not only be too involved, but probably would be beyond its authority.

In concluding his remarks to the Convention, Mr. Rutledge said: "Because I believe that the progressive steps looking to a uniform definition of major crimes, and the collection of statistics on these crimes for dissemination to the public should originate and be carried forward

by police officers, I renew the suggestion that a competent and energetic committee be appointed for these purposes." The committee was authorized and consists of: Commissioner William P. Rutledge, Detroit, Chairman; Chief Joseph A. Gerk, St. Louis; Chief Jacob Graul, Cleveland; Chief James Higgins, Buffalo; Chief L. V. Jenkins, Portland, Oregon; Chief Thomas Healy, New Orleans; Superintendent Michael Hughes, Chicago; and Chief August Vollmer, Berkeley, California. Several other appointments are yet to be made.

This program does not take into consideration judicial and correctional statistics. The police recognize the importance of fact finding in these branches of the government, but appreciate that they cannot ask for adequate statistics from others until they have shown an inclination to remedy the defects existing in their own procedure. Practically, the labors of the police are ended when they have apprehended the offender, marshalled the evidence, and presented the case to court through the prosecutor. Having in mind the vagaries of our present judicial system, the police are reasonably entitled at this point to clear their complaint records involved.

The procedure of the court and the final disposition of the case is of interest to the police only as throwing light on the coöperation between that branch of the government and the others. At the present moment, it is for the courts and the prosecution to keep records of facts that relate to their own efficiency—the time elapsing between arrest and examination, between examination and trial, amount of bail, character of security required, continuances given, mental and social examination made, results of the trial, penalty inflicted, etc. But eventually these statistics must be correlated with those obtained by the police and with those produced by the correctional institutions to which offenders are committed.

Securing adequate police statistics will be sufficient to engage the energy of all interested for the next few years and probably it will be the easiest end to accomplish. This is because the police organization is relatively homogeneous throughout the country and the International Association of Chiefs of Police affords a body through which the work can be done. No similar organization exists in the judicial field. But once the police are collecting data which will throw some light on the cause and cure of crime, it may be expected that the other agencies concerned with these problems will fall into line.

THE BEST INDEX NUMBER FOR STABILIZATION PURPOSES

By Hudson B. Hastings

In the discussion of this topic I believe it is essential to start with a clear conception of the objectives of stabilization. Briefly stated, these are:

(1) To secure a much better standard of value for the promotion of economic justice in debtor and creditor relationships.

(2) To mitigate so far as may be possible by monetary means, the severity, length and frequency of periods of depression in general business activity.

Stabilization on the basis of any broadly representative index number would be far better than no stabilization at all, but what is the best index number?

My discussion will not include all phases of the problem but will be almost exclusively concerned with what appears to me to be the most important phase, namely, the selection of the items which enter into the index number. I shall also assume without analysis that practical considerations make it necessary to adopt an approximately fixed index number as a guide.

As the first step, we should restrict our selection to new goods which are in finished form for the consumer, since the promotion of economic justice in debtor and creditor relationships is not concerned with second hand goods, or with the prices of goods at the earlier stages of production, and the stabilization of the price of finished goods would strongly tend to prevent fluctuations in the state of industrial and business activity at all stages. The special problem raised by the fluctuations in food stuffs due to changes in crop conditions may be reasonably solved by taking the trend prices of such goods instead of current prices.

With these preliminary observations in mind, let us proceed: Goods and services may be divided into three general groups:

(1) Those which are freely reproducible, and produced under competitive conditions.

(2) Those which are produced under more or less monopolistic conditions.

(3) Non-reproducible goods.

Strictly speaking, of course, no goods are freely reproducible, as the supply of all goods is to some degree limited by natural resources, but

if a moderate additional supply of a good may be freely produced at a cost not appreciably in excess of present costs, I would classify it as freely reproducible.

If the price index of this group were kept constant, economic justice would be greatly promoted, and it would also be a powerful influence in promoting the attainment of our second objective.

We must recognize, however, that a fixed price level would not insure exact economic justice between all creditors and debtors, as the price index of the goods purchased or sold by individual creditors or debtors would rarely be coincident with the stabilized price index. Exact economic justice is unattainable.

Recent research by Dr. W. I. King shows that there has developed an apparently consistent spread of approximately 25 per cent between the index numbers for two important classes of consumers during the past thirteen years. However, this study also shows that a much higher degree of justice would have been attained if we had had price stability based on the goods consumed by consumers taken as a whole.

If retail prices were used as the basis for stabilization, creditors would not be permitted to share in any possible decrease in the real cost of producing and distributing the goods entering into the index number, but they would share in gains in efficiency in producing or distributing non-standardized goods. If wholesale prices were taken as the basis for stabilization, they would share in the gains arising out of an increase in the efficiency of distributing all goods.

The attainment of an approximately fixed price level for freely reproducible goods would also contribute to the much fuller use of the man power and capital equipment of the country, thus benefiting the debtors, in addition to the gains which the latter might make out of increasing efficiency. Our experience during the past five years gives substantial confirmation to this thesis.

Thus under present conditions, an approximately fixed price level for freely reproducible goods would promote the attainment of both of our objectives.

Next we may consider the arguments for and against including wages in the index number. If wages are included it would mean that as the efficiency of labor increased the wage earner would secure part of the rewards of this increased efficiency in higher wages and part in lower prices. On the other hand, if wages are not included in the index number he would have to look solely to an increase in wages in order to obtain his share in the increased effectiveness of his efforts.

The possibility of stabilizing an index number which would be made up entirely of the prices of various classes of labor, should not be over-

looked. Indeed, as Dr. Maurice Leven has recently pointed out, there are reasons why such an index number would theoretically provide the best basis for stabilization.

However, on account of the limited length of this paper, it does not seem wise to enter into an analysis of this proposal, as there are substantial reasons why it would not be wise to attempt stabilization on the basis of an index number of wages, or even to include wages in index of prices to be used for this purpose.

In the first place, the growing tendency toward basing wages on measured output, the constantly changing character of jobs, and the wide range of the efficiency of labor, would make it very difficult to compare wage rates over a series of years. Second, wages constitute a relatively small part of the budget of the typical consumer. But probably of much greater importance than either of these is the fact that labor would unquestionably be strongly opposed to any attempt to stabilize wages. They would have real and important reasons for such opposition and in addition they would not realize that increased efficiency in labor would ultimately accrue to their benefit through lower prices.

Next let us consider the reasons for and against including the prices of goods produced under more or less legally protected monopolistic conditions. Such goods are of two classes:

(1) Articles protected by patent rights.

(2) Goods in which an important element of cost is made up of land rent or of raw materials, the supply of which is so limited as compared with the demand, that the owners of such supply may charge a price considerably above the real cost of production.

I believe that there would be virtually unanimous agreement that the first class should not be included in the index number.

In view of the growth of population and our limited natural resources, we should also exclude the second class from the price index, as it is quite probable that such goods will increase in relative value and to include them would force a reduction of the prices of freely reproducible goods, a situation which would be directly contrary to the attainment of our second main objective. Moreover the stabilization of an index number which included the prices of such goods would not prevent the exploitation of our natural resources to the same degree as is now possible, and there is no reason why we should seek to protect creditors as a class against an increase in the relative value of such goods. This burden should be shared by all.

The third general group of goods which I have suggested is non-reproducible goods, which would include such items as land, products of master craftsmen, and securities.

The volume of trade in the first two items, including the rent of land, constitutes a considerable part of our total trade, but the reasons which I have just stated afford ample grounds for excluding the prices of such goods from our index number. Some element of land rent inevitably enters into the prices of even the most freely reproducible goods, but it should not be included as a separate class of goods.

There are also good grounds for not including the prices of securities bearing a fixed rate of interest in our price index, as the prices of these securities will, and should, fluctuate in response to changes in the market rate of interest. There is no reason why we should attempt to protect creditors against changing interest rates, and to offset changes in the prices of such securities by opposite changes in the prices of freely reproducible goods would involve an unsettling influence on the continuity of business activity. For similar reasons and in addition, because of the fluctuations due to waves of speculation, I believe that prices of stocks should not be included in our index number.

I have omitted a consideration of the selection of the proper price level at which prices should be stabilized, of the weights to be assigned to the items which may enter into the index number, and of the question of whether manufacturers', wholesalers', or retailers' prices, or all of these together, are to be taken. These are questions which must be settled, but their analysis has been omitted from this paper, both on account of the fact that they appear to me to be of much less importance than the phase of problem I have discussed, and because their discussion would take more time than I have available.

I have also omitted a discussion of the influence of changes in the disutility of labor and in the utility of money, factors which might be of some importance over long periods of time.

My final conclusions with respect to the best index number to serve as a basis for stabilization are that:

(1) In constructing such an index number, the objectives of stabilization must be constantly kept in mind, and therefore,

(2) It should be composed solely of prices of new, finished goods which are produced and sold under conditions of reasonably free competition, and

(3) The above objectives will be well served under present conditions by maintaining such an index number at an approximately fixed level.

THE BEST INDEX FOR USE IN STABILIZING THE PRICE LEVEL

By Willford I. King

Nowadays, when the subject of stabilization is broached, one of the first questions which is likely to be raised is: "What index number will be used as the basis for the stabilization process?" This is the question with which I am asked to deal. My own opinion is that this particular problem is one of but minor significance. Almost any reasonable price-index would answer very well for the purpose. Had the dollar been stabilized in 1913 on the basis of Dun's, Bradstreet's, The Annalist's, or the United States Bureau of Labor Statistics' index of wholesale prices, the results would have been reasonably satisfactory, and most of the evils resulting from price changes would have been eliminated. Doubtless, somewhat better results might have been obtained by using the United States Bureau of Labor Statistics' index of the prices of food at retail. The present official series relating to the cost of living and wages were not then in existence, but, had they been, they would have served admirably. On the basis of 1913, none of them are far enough apart at the present time to make the results differ materially.

It is, however, desirable, when adopting a definite program, to use as a basis, not merely a fairly satisfactory index, but the best one available; for the cost of computing a very good index is too trivial to be of consequence. I shall, therefore, discuss the matter from the point of view of one who believes that it is possible to secure an index number which will give not only reasonably satisfactory, but highly satisfactory results. It is especially desirable that such an index series should have a correct long-time trend, for, since many bonds, life insurance policies, and the like, run over a long period of years, a trend which is even slightly erroneous may give rise to a considerable error before the time of payment arrives.

The first step in determining what type of an index number to use, is to decide what kind of a standard of deferred payments will be most satisfactory to the majority of individuals. Concerning this matter, a variety of opinions have been expressed.

Dr. Maurice Leven of the New York State Housing Commission makes the novel proposal that, for purposes of stabilization, an index of average wages per hour, would give the nearest approach to justice for all. The reasons for his view may be summarized thus:

At present, in the United States, we are, fortunately, in an era of increasing production per capita; in other words, with the passage of time, an hour's labor comes to produce a larger amount of commodities than was formerly the case. With such conditions prevailing, it is only just that the creditor should participate in the economic progress of society, and he should, therefore, when his loan is repaid, receive a larger amount of commodities than he loaned. This arrangement works no injustice to the debtor for, under conditions of increased productivity, it is easier for him to obtain a given number of dollars than it was when he borrowed the money. Since, when productivity increases, hourly wage-rates rise, an index of average wages per hour would serve as a satisfactory criterion of the economic progress of the nation.

Dr. Leven believes that there is still another advantage in using an index of hourly wages as a basis for fixing the value of the dollar. With the dollar stabilized along these lines, wage contracts covering long periods of time might be made between employers and labor unions, for, manifestly, without any adjustments in such contracts, the laborers would share in the general progress of society as a whole; whereas, if wage contracts were fixed on a commodity basis, it would be necessary to modify them constantly in order to take account of the changing productivity of labor.

Although it must be admitted that there are certain marked advantages in following Dr. Leven's suggestion and using as a standard an index of the price of hourly wages, there are also serious objections to the adoption of this plan. One is that his proposal is contrary to the prevailing conception of justice between debtors and creditors, for most people probably believe that, in addition to his interest, the creditor is entitled to receive only the same amount of commodities which he loaned. A more serious objection is probably one that is political rather than economic in nature, namely, that, with prices stabilized on this basis, it would be difficult to convince the average trade unionist that labor was really participating in the economic improvement of society, for the fact that wages, as measured in cents per hour, would remain unchanged year after year, would probably give the impression that labor was not advancing, but was being held down for the benefit of other classes.

Because of the difficulties just mentioned, it appears wisest, in choosing a standard to be used as a basis of stabilization, to conform to the view most commonly held—namely that the standard should be such as to make the amount of goods repaid equal to the amount loaned. However, even if we accept this principle as a basis of action, we find

that, before it can be applied, many details must be worked out. Most long-term contracts are made in terms of money and not in terms of goods. Different creditors sold different goods in order to obtain the money which they loaned. No one can tell what type of goods the various creditors will desire to purchase years hence when the respective loans come due, and there is no way of knowing what kinds of goods the individual debtors would need to dispose of in order to obtain the money to pay their respective debts. Under such circumstances, we may be quite sure that the index number which gives absolute justice to any one creditor will probably not be exactly fair either to other creditors or to the man who owes him money. Similarly the index that proved just, as regards one debtor, might be distinctly unfair to another debtor. The best, therefore, that can be done is to fix upon some general standard which, so far as can be foreseen at present, is likely to give the maximum of satisfaction to the largest number of people. What ought the characteristics of such a standard to be? To make the question more specific, what articles ought to be included in the list used in the construction of the index number? Since, as has just been pointed out, it is entirely impossible to give exact justice to individual debtors and creditors, the best that can be done is to adopt a standard which will be as nearly equitable as may be for these classes as a whole. From this standpoint, it appears that the logical policy is to make the index as inclusive as possible. The most inclusive index is that which measures the general purchasing power of the dollar—in other words, the average price of all goods bought and sold in the United States, and it is this index which, therefore, seems best adapted to the purpose at hand.

Now, if all goods were standardized, and if records of all sales were properly tabulated, one could arrive at an accurate index of general purchasing power by the simple process of dividing the total value of all goods sold by the total number of physical units sold. Variations from year to year in the average price per unit would give the index series desired. However, commodities are measured in a great variety of units. We have acres of land, yards of gingham, quarts of milk, bushels of potatoes, and pounds of sugar. How can these be added together? The most feasible plan of accomplishing this end appears to be that described by Professor Irving Fisher in his book on *The Purchasing Power of Money*. He proposes to consider as a unit whatever quantity of any commodity happened to sell for a dollar at the base date. By adopting this method, it becomes perfectly feasible to combine all kinds of diverse commodities into an aggregate number comprising all units. True, the number of units of any given commodity

would be changed by shifting the base date, but the chances are that, with an inclusive index containing many hundreds of commodities, the choice of the base would affect but slightly the course followed by the index series. Doubtless, statisticians would still quarrel vigorously on the subject but it would make little difference what decision was arrived at.

The real difficulty in constructing an index of the general purchasing power of money lies, neither in the choice of the base, nor in the determination of the formula to be used, but rather in the fact that so many important categories of commodities are not susceptible of standardization, each unit differing from the rest in one or more of a thousand possible ways. For example every piece of land has its own peculiar advantages or disadvantages—and real estate constitutes the largest item of natural wealth. Unfortunately, it is not the only important class of property lacking standardization. At first thought, a share in a corporation seems to be a standard article, but the fact is that it is merely a fixed fraction of a constantly changing *ensemble* of property. Furthermore, corporations have the habit, inconvenient for the statistician, of issuing stock dividends. scrip, etc., and each such issue changes the fraction represented by a single share. Under the circumstances, corporate shares are far from being standardized articles of commerce. Automobiles constitute another very important type of goods which is anything but standardized, for most companies change models each year. Phonographs, radios, and various articles of furniture are constantly varying in style so that it is extremely difficult to obtain for them price quotations comparable at different dates. The same may be said of clothing, art goods, etc.

In practice, then, the best that can be done in making up a suitable index for use in stabilizing the value of the dollar, is to employ in its construction only prices of such articles as are fairly well standardized and for which comparable quotations can be obtained year after year. The number of such articles is, of course, very large and probably can be depended upon to fluctuate in much the same manner as the missing non-standardized commodities.

A question of importance concerning such an index of general purchasing power is whether or not bond prices are to be included in its construction. The value of corporate, municipal, state, and national bonds sold each year is very large, hence changes in their value doubtless have a marked influence upon the general purchasing power of the dollar. However, it seems certain that bond prices must not be included in any index used as a standard of deferred payments, for, after all, bonds are merely claims to a certain specified number of dollars at

a given date; therefore they neither tend to fall in value when the currency supply is contracted nor to rise in value in periods of inflation, the latter fact being one which European bondholders discovered to their sorrow during the period immediately following the War.

While it is probably unnecessary to attempt to refine an index of this type, it is possible to increase its accuracy as regards cyclical movements, by superimposing upon the trend of prices of standardized articles, obtained in the manner just described, a cyclical index including not only standardized articles, but also such important classes of non-standardized articles as corporate stocks, house rents, hourly wage rates, etc.

The best formula for computing the index series to be used as a basis of stabilization seems to be the one suggested above, namely, that obtained by dividing the total value of the standardized commodities sold in the given period, by the total number of physical units represented by this total value. The resulting quotients may be reduced to relatives on any base desired. This type of index number is elastic in that it takes into account the changes in the nature of consumption occurring from year to year.

An inclusive index of this type will manifestly contain in its make-up commodities varying radically in nature and use. Some will be ready for consumption; in other words will be what we commonly refer to as direct goods. Others will need to go through many stages of manufacture before they are ready for the consumer; in other words they are definitely indirect in their nature. Now, the price of direct goods is determined primarily by the supply and demand thereof at the given moment. The price of indirect goods, on the other hand, is largely psychological and depends upon present anticipations concerning the prices at which the direct goods, into which existing indirect goods promise to mature, are expected to sell at some future date. Strawberries, for example, are direct goods which must be eaten or preserved within a day or two or they will decay, hence, their value is dependent upon the immediate supply of and demand for them. Pig iron is, however, different. It cannot be used directly to satisfy human wants. Its value depends, then, upon the guesses of the would-be buyers and sellers as to the prices at which steel rails, structural steel, automobiles, coal cars, and a thousand other things are expected to sell months or years hence. Since we cannot know anything about the future, our guesses are subject to many and varied influences: Hence the price of pig iron may be radically affected by any wave of optimism or pessimism even though this wave may be based upon nothing tangible.

The more indirect a good is, the more is its price affected by psychological forces. These guesses about the future have practically no influence upon the price of strawberries and very little upon the price of bread or beefsteak, but they affect materially the value of copper, wheat, and lumber, and influence to a still greater extent the price of corporate shares, for stocks are one stage more indirect than are raw materials.

The reasons just mentioned presumably account, in the main, for the fact that commodities at wholesale, and stock prices, show such large cyclical fluctuations, while consumers' goods maintain a much more even trend. Such evidence as we possess, consisting mainly of the results of computations made by Carl Snyder of the Federal Reserve Bank of New York, indicates that the course of the general purchasing power of money tends to follow much more closely the path of the prices of direct or consumers' goods than the path of prices of commodities at wholesale. This situation is what is naturally to be expected, since it is the prices of direct goods which furnish a tangible basis for the prices of indirect goods. When the public guesses wrong as to the future course of the prices of direct goods, there is an inevitable tendency to correct the guess as time passes and the error becomes evident. We have, then, the phenomenon of prices at wholesale fluctuating about a trend approximately paralleling the trend of prices at retail.

It is my belief that, in making plans for stabilizing the purchasing power of the dollar, we should employ an index which tends to follow a smooth trend, rather than to use one which participates in cyclical movements having their origin primarily in psychological errors. Should we follow the other course and evaluate the dollar on the basis of a fluctuating index like that of commodity prices at wholesale, we would be in the anomalous position of forcing prices at retail to fluctuate with every wave of the business cycle, thus giving to the salaried employee and to the wage worker a dollar constantly varying in purchasing power as measured in terms of the goods which they buy. To my mind this result would be distinctly undesirable.

If the premises just set forth are correct, it appears, then, that the ideal index for use in stabilizing the value of the dollar is one including as many commodities as possible, weighted according to the quantity consumed in a given year, the units used being a dollar's worth in the base year. Such evidence as exists indicates, however, that practically the same results may be obtained by the simple process of using a similarly weighted index of the price of consumers' goods—and there are fairly good reasons for contending that such an index is superior on

theoretical grounds. An index compiled by the National Bureau of Economic Research shows the estimated trend of the prices of goods used by all consumers in the United States since the year 1909. While this is based upon an incomplete list of commodities, the comparative smoothness of its trend indicates that it would be satisfactory as a basis for stabilizing the value of the dollar. The differences between it and the more inclusive index prepared by Carl Snyder are negligible.

I have taken considerable time to explain the nature of the index which, it seems to me, would be best adapted to the purpose at hand. In closing, however, I desire to reiterate my first statement—namely that the stabilization movement should, under no circumstances, be delayed because of failure to agree upon the best type of an index to use, for almost any index that is likely to be chosen will give results reasonably satisfactory and infinitely superior to those which will probably eventuate if the value of the dollar is allowed to drift aimlessly, as it has been in the past.

DISCUSSION OF DR. KING'S PAPER

By Miriam E. West

Professor King has pointed out that the index to be used for the purpose of stabilization of the price level is dependent upon the purpose sought by means of stabilization. The purpose which he emphasizes is that of justice between creditors and debtors. But despite the fact that the changing price level produces an enormous injustice between these two classes, transferring billions of dollars of purchasing power from one class to the other, it seems highly probably that the effect which it has upon productive activity is even more detrimental to the welfare of society. It is true that the phenomenon of the changing price level is largely, if not wholly, one of redistribution of titles to wealth. But this redistribution or its expectation is the primary force in credit inflation. By widening or narrowing the margin between costs and selling prices it offers inducements to business men to positive action or withholding of action. This concerted action of business men we term the phenomena of booms and depressions. It is this effect of the changing price level that is more catastrophic than the injustice due to money contracts. In this connection we have not only a transfer of wealth from one group of society to another but actual physical loss of wealth and income.

Hence the major purpose of price stabilization should be the leveling out of the fluctuations in industrial activity, so far as these result from monetary causes, by removing inducements to business men of speculative gain arising out of a changing price level and offering inducements of profits arising out of efficiency.

Professor King maintains that we cannot expect stability of the price level to result in stabilization of productive activity, since stabilization of the average of prices will not stabilize individual prices and hence the opportunities for gain resulting from conjunctural price movements will still be there. In answer to this I would call attention to the charts which Professor Mills used in discussion of price movements.[1] From these it is evident that comparative stability of the price level, such as that found in the period from about 1909 to 1913, is accompanied by relative stability of price changes in relation to each other. Therefore it seems reasonable to expect that stabilization of prices would result in less expectation of speculative gain on profit margins resulting from price movements.

[1] F. C. Mills, *Post-War Prices and Pre-War Trends*, *supra*, p. 45.

For the purpose that we have suggested, a wholesale commodity price index is desirable, either weighted by the value of commodities sold upon the market or by the number of persons engaged in the industry—the population weighted index which has been suggested by Professor Commons. The prices should be those of wholesale commodities, since the increased credit which brings about inflation enters our monetary system as loans extended to merchants and producers for commercial transactions and hence as purchasing power for wholesale commodities and reacts immediately on their prices. Moreover credit inflation should be stopped at its source and not several months later when its effects are seen in other prices.

Since fluctuations in the level of wholesale prices are reflected several months later, much dampened to be sure, in retail prices, it is to be expected that a stabilization of the level of wholesale prices will result in the stabilization of retail prices and hence justice will result between creditors and debtors. I can see no reason to fear, as Professor King does, that stabilization of the level of prices of wholesale commodities will result in fluctuations of the retail prices about this level. He seems to neglect the functional relationship which exists between the two. During our periods of comparative stability of prices, 1909–1913 and 1923–1927, there has been no tendency in this direction.

Wages should not be included as a separate series in the commodity price index. For the months of January to July, 1927, the total payroll in manufacturing industries was about 94 per cent of what it was in 1923. Thus while wages have continued on a high level increasing somewhat, employment has been decreasing with the increasing efficiency made necessary by the narrow margin of profits. The inducement of expected profits has not been great enough to bring about the employment of extra workers in new lines or in the expansion of old industries. Yet an index which included wages together with commodities would have remained fairly stable since 1923. Is such stability of the price level desirable? In other words, is the unemployment that exists in the United States today desirable from the point of view of economic welfare?

THE STATISTICAL EVALUATION OF THE RESULTS OF SOCIAL EXPERIMENTS IN PUBLIC HEALTH

By Edgar Sydenstricker

The task of applying the methods of scientific inquiry and analysis to the study of human beings in their social relationships has always been regarded as so difficult by everyone, except those carefree persons who are unacquainted with scientific processes, and so are blissfully unaware of the pitfalls involved, that I hope you will bear with me if I dare to approach a Gargantuan problem with uncertain steps and many outcries of caution. For the particular path of approach which is the topic of this essay is beset with obstacles whose aspect becomes the more terrifying as one draws nearer to them.

I suppose that some of this fear is engendered by a habit of limiting the field of science to objects that can be manipulated at will or that at least are fixed in their attributes; whereas, in evaluating the effect of a condition or factor upon society, we are faced with the impossibility of regarding human beings as inanimate objects and with the difficulty of treating them as laboratory animals. We cannot easily separate a population into two homogeneous moieties and use one as an experimental group and the other as a "control." Yet that is essentially what must be done, statistically or otherwise. It is not hard to set up the logical procedure which ought to be followed; the hard thing is to follow that procedure when we have before us a maze of interrelated, changing phenomena. One is reminded of Whewell's [1] plaintive and somewhat querulous criticism of Mills' famous canons in the battle of the methodologists a half century or more ago: "When we have any set of complex facts offered to us," he asked, "and when we would discover the law of nature which governs them, where are we to look for our *ABC* and *abc*? You say *when* we find the combination *ABC* with *abc*, and *ABD* with *abd*, then we may draw our inference. Granted, but when and where are we to find such combinations?" This is merely a confession of failure—not a limitation upon science. "There is a certain school of thought," as Pearson once incisively remarked, "which finds the laborious process by which science reaches truth too irksome," and which says that "wherever science has succeeded in ascertaining the truth, there . . . are the legitimate problems of science," but that "wherever science is yet ignorant, there . . . the method is inapplicable." [2]

[1] William Whewell, *Philosophy of Discovery*, p. 262. [2] Karl Pearson, *Grammar of Science*, p. 18.

Science too long has been ignorant in the field of social experiments, not because it can learn nothing, but because of a reluctance to regard the evaluation of the results of such experiments as essentially a part of the experimental method. In other words, we have not gone about the task in a scientific way. Is it not true that most of our social programs have been purely administrative and that their purpose and method are to put into effect a procedure which is believed to be effective and which, in fact, has not gone very far beyond the stage of mere hypothesis? Is it not usual to regard the mere "putting over" of a project as the final test of success? Public health projects, for example, are now measured largely in terms of the volume of activities or at best according to some qualitative standard that is based upon opinion rather than empirical conclusion, and it would not be difficult, I suspect, to find that many of our so-called "social experiments" are not really experiments at all but the imposition of untested hypotheses. Obviously, criteria such as these will not suffice. They will not satisfy even the patient Babbitt who is the victim of so much theorizing as well as of our Menckenian fashion to ridicule.

On the contrary, the thesis may be offered that the evaluation of the results of a social experiment *can* be made provided we define clearly its purpose, record the results in objective and valid terms, and follow faithfully the principles underlying scientific experimentation both in planning and in conducting the experiment and in drawing conclusions. I may be permitted to speak only of the field of public health, but in support of this proposition I would like to try to set forth very briefly, first, some of the requirements involved [1] and, secondly, to refer to a few examples that may illustrate partially their application.

1. The results of a social program, such as public health or even one of its major activities, cannot be measured unless *each specific project is regarded as a distinct experiment* and the results of this project are evaluated in terms of its specific objective. Thus, the gross mortality rate or a life table expression can at best reflect very feebly the net effect of a single factor for the reason that it is impossible to take into account the many factors involved. On the contrary, we may reach far more satisfactory conclusions if we use the incidence of milk-borne typhoid fever in measuring the results of milk pasteurization; the incidence of diphtheria among children of a specific age in measuring the results of immunization of children of the same age; the progress of tuberculosis from incipient to active stages in measuring the results of those specific activities which are directed toward the prevention of

[1] Edgar Sydenstricker, "The Measurement of Results of Public Health Work." Reprinted from the *Annual Report of the Milbank Memorial Fund*, 1926, pp. 15–25.

active tuberculosis among incipiently tuberculous persons; and the like. When this is done, the precise part played by various social activities in bringing about a general result, such as the reduction of the gross death-rate, may be more clearly known.

2. It follows that *indices of results should be selected which denote the specific objective of the experiment as definitely as possible.* It goes without saying that these indices should be as objective in character, quantitative in form, and logically valid, as it is possible to make them. It is equally obvious that where factors other than the object of the experiment must be considered, the indices of these factors must also be objective, quantitative and valid. I mention this well understood statistical postulate because apparently there is an unfortunate misconception, not infrequently manifested, of the use of partial and multiple correlation, for example, which seems to express itself in great precision as to decimal numbers and probable errors but exhibits a readiness to use rather rough and not very relevant indices of the factors to be taken into account.

3. The essential principles underlying sound methods of measurement are those of *scientific experimentation.* We cannot deviate from that basic requirement if we are to succeed in evaluating the effectiveness of social efforts. It does not matter what degree of simplicity of terms we may choose to employ in describing methods or in proclaiming results; by all means let us use words of one syllable whenever we can. But, whether we call it the use of "common sense" or the application of the accumulated wisdom of generations of technicians, whether it be evaluating the effect of a single cause or determining the resultant influence of several factors among the complex interrelations of many conditions, whether we state our conclusions for the laity or for the erudite, the fundamental postulate is the same for all: The principles of experimentation must be rigidly followed.

4. To express this fundamental conception a little more clearly, let us attempt to restate some of the purposes of experimentation:

(1) To find out whether or not a *hypothesized* procedure can accomplish a result under given conditions; or,

(2) To show that an *accepted* or *proven* procedure will accomplish a specified result under given conditions; or,

(3) To *ascertain how much of a result can be accomplished* under given conditions by the application of procedures that have already been proven or are accepted as effective.

By "under given conditions" we may connote, on the one hand, those conditions comprised under the general terms of the situation to

be dealt with, including the population and its environment; and, on the other hand, those conditions set by the limitations of operation, such as a maximum per capita cost, etc.

Now, in order to attain any or all of these ends, it is clear that *the principle of "control" in observation or experimentation must be rigidly applied.* The process of evaluation, whether it be the analysis of past events or concurrent phenomena by statistical methods in order to discover their relationships or the influence of a given factor, or the deliberate manipulation of conditions, postulates *a comparison* of events that follow when the specific factor is present or introduced in varying degrees, with events that follow when that factor is not present. When such a comparison is made possible, we say we have a "controlled" experiment.

In general, our comparisons may be classified under two varieties: (1) Contemporaneous comparisons of effects in two or more groups, and (2) Chronological comparisons of the effects in a single group over a period in which the factor to be measured has varied in its force. A third kind of comparison is possible, of course, when both the contemporaneous and the chronological comparisons can be combined. It is easy to set up "controls" in some form or other. The difficult thing is so to plan our comparison that the "control" population groups shall be in all essential and relevant respects the same as the experimental group, save in the one respect which constitutes the thing to be tested or measured. Or, if the "control" and "experimental" groups are not comparable in certain respects other than the one to be measured, these differences must be themselves capable of evaluation. It is sometimes more difficult, when we cannot manipulate the conditions, to evaluate the effect of factors other than the one we wish to test or measure. Yet obviously this comparability—whether it can be planned deliberately or attained by statistical methods—is the very essence of even an approach to accurate measurement.

5. *The result which is to be measured cannot be established by statistics only but must fit into a process of logical reasoning* that takes into account all of the available knowledge which is pertinent to the specific problem.

Frost [1] has made the sound observation that a "statistically significant" drop in the typhoid rate following the installation of a pure water supply in a city which previously had been using a grossly polluted supply, "does not at all warrant the conclusion that the reduced incidence of this disease is the result of the improvement in the water supply." Cognizance must be taken of the fact, as he points out, that

[1] W. H. Frost, "Rendering Account in Public Health," *American Journal of Public Health*, May, 1925, XV, p. 395.

a similar result has occurred elsewhere under similar conditions and that no reduction in typhoid usually occurs under observed conditions. Even this does not establish anything more definite than a *statistical*, or inductively ascertained, association of facts. It is necessary, to quote him further, "to bring in the whole theory of typhoid fever, that is to say, all the facts known about the disease, arranged in such orderly array that each fact bears a definite and rational relation to all the others. By virtue of this theory, and not otherwise, we may proceed to ascertain and demonstrate that no condition likely to affect greatly the prevalence of typhoid fever except the change in water supply has been altered during the period under consideration, an item obviously necessary to the conclusion."

One important corollary of Frost's observation is that the evaluation of a social experiment, such as an effort to control a disease, is not to be undertaken by any one who is not thoroughly familiar with the etiology of the disease and its epidemiology in the specific situation. It is not a pastime for the statistician trained only in the technique of his trade; rather, it is a task for the specialist in the disease who is adequately equipped by nature and properly trained in the basic processes of scientific inquiry of which the statistical method is one.

6. Lastly, in view of the fact that, as Whewell said, we rarely find our *ABC* and *abc* and our *ABD* and *abd* made to order for us, and in view of the rigid requirements of scientific reasoning, the evaluation of the results of a social effort should begin with its planning, should be carried on as an essential part of its execution, and should be regarded as the most important of its aims. In short, an experiment cannot be a successful experiment unless its results are measurable.

I am aware that the line of thought which I have followed only a little way does not afford much encouragement to the enquirer who desires either to find out from existing records the extent to which a social effort has accomplished a result in the past, or to ascertain the degree of association between varying amounts of a social effort and of a result in contemporaneous groups. The only consolation to him is that he *may* find ready for him some of the records that he needs which will afford a partial answer. The fact is that satisfactory records for the past do not exist except in rare instances, and contemporaneous existing records do not ordinarily meet our requirements for the sort of experimental analysis that we wish to make. For the most part, therefore, the evaluation of results of social efforts must be planned *de novo* as an essential part of the experiment.

Let me use, as an illustration, the problem of evaluating the results of the anti-tuberculosis work.

The death-rate from tuberculosis has been declining, according to all available records in civilized countries, for the past 150 years. To what extent has this decline been due to the recent "campaign" against the disease? Obviously this is a complicated question. The decline of the tuberculosis death-rate is so merged in the current of our social, economic and scientific history that it has become indistinguishable from other forces which have entered into the evolution of modern social ideals and the industrial revolution. The reduction of mortality from the disease undoubtedly has been helped by some of the very conditions attending the urbanization of the population that were concomitant with conditions which anti-tuberculosis efforts tried to ameliorate. Such a net result, for example, is the tubercularization of city people. It has been helped by the development of public health administration, particularly by the control of infectious diseases and by the efforts to lessen infant mortality. It has been helped by the emergence of new standards of living, of humane as well as efficient conditions of labor, of ideals of play and recreation, of an esthetic as well as an utilitarian emphasis upon physical health. On the other hand, directed as the anti-tuberculosis movement must be against poverty, overcrowding, ignorance, and insanitary environment in order fully to attain its aim, it has contributed to the betterment of mankind in more ways than the reduction of tuberculosis infection, the prevention of active cases, the arresting of the disease in affected persons, the prolongation of the lives of serious cases and the promotion of general as well as personal hygiene. It was in the vanguard of public health work in its earlier years, along with efforts to control the visitation of dreadful epidemics, and it has proven to be the leader in the modern movement of the preventive medicine.

I do not believe that it is possible, because of the lack of necessary data, to evaluate the separate and specific effect of the anti-tuberculosis movement upon the mortality rate from the disease in the past.[1]

Even when a carefully planned experiment is undertaken, it is difficult to measure the results accurately. As a part of a rural health experiment, the Milbank Memorial Fund put into operation some five years ago a modern anti-tuberculosis administration in Cattaraugus County, New York, and we are now getting to a point where results can be watched. In Chart I the course of the tuberculosis mortality rate has been plotted for the period 1900–1927 and the statistical significance of the rates for 1925, 1926 and 1927 is set forth in Table I. The facts relating to the tuberculosis death-rate in three counties selected as

[1] Edgar Sydenstricker, "The Declining Death Rate from Tuberculosis," *Proceedings of the 23rd Annual Meeting of the National Tuberculosis Association, 1927.*

CHART I

MORTALITY RATES FROM TUBERCULOSIS IN CATTARAUGUS, JEFFERSON, STEUBEN, AND CHAUTAUQUA COUNTIES, NEW YORK STATE, 1900–1926

A straight line was fitted to the series of rates for each county for the period 1900–1922, and the values of the trends are indicated on the diagram.

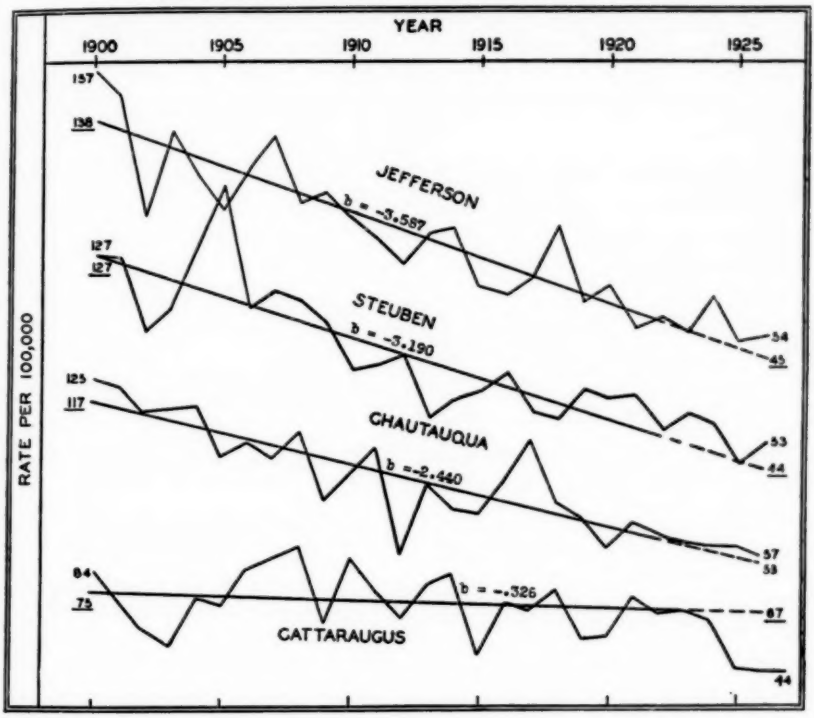


TABLE I

TUBERCULOSIS MORTALITY, 1900–1926 (1927) IN FOUR COUNTIES

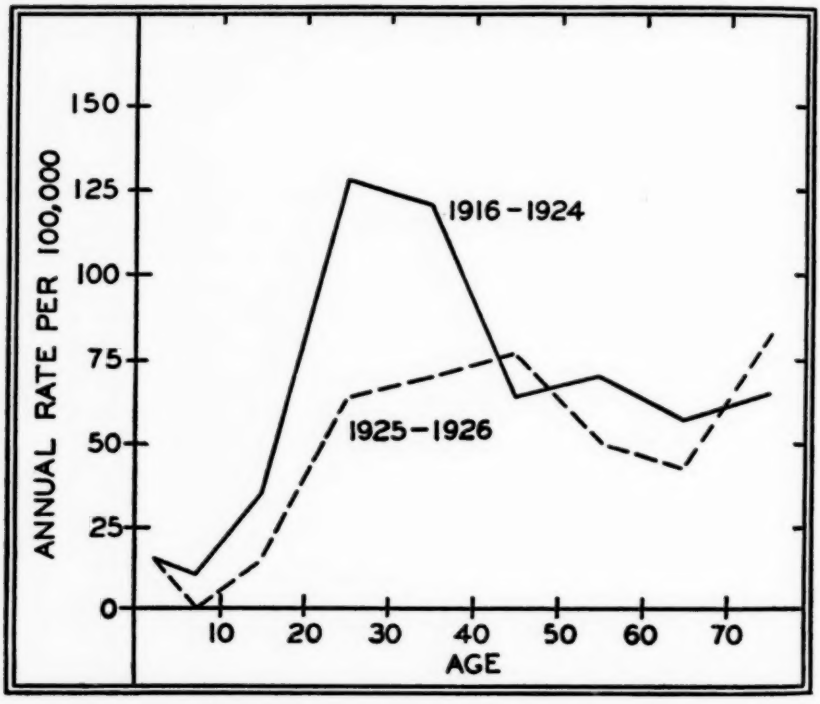
		Jefferson	Steuben	Chautauqua	Cattaraugus
Mean rate per 100,000 (1900–1922)		98.69	91.94	90.02	71.68
Trend (value of b)	"	$-3.59 \pm .09$	$-3.19 \pm .11$	$-2.44 \pm .12$	$-.33 \pm .14$
σ of mean rate $\left(\sqrt{\frac{pq}{n}}\right)$	"	11.07	10.49	9.15	10.36
σ of deviations from trend	"	11.79	13.22	10.78	11.34
Lexian ratio		$1.26 \pm .11$	$1.07 \pm .13$	$1.18 \pm .12$	$1.10 \pm .11$
Difference between calculated (trend) and actual rates:	1925	*	2.3	*	21.81
	1926	*	*	*	23.08
	1927 †	....	....	....	22.45
Probability that a deviation as great as the one observed would occur: ‡	1925	....	....	....	.0274
	1926	....	....	....	.0207
	1927 †	....	....	....	.0239
	1925×1926	....	....	....	.000567
	1925×1926×1927 †	....	....	....	.0000136

* Calculated rate is lower than observed.
† Based on provisional data.
‡ Based on σ of deviations from trend.

"controls" (without regard to the previous course of the rate, as it happened) are also shown. The conclusion seems justified that in Cattaraugus County there occurred a decline in the death-rate from tuberculosis in 1925–1927 which was unique so far as the previous recorded experience of that county is concerned. Of more significance, however, are the ages at which this reduction occurred, as shown in Chart II, an event which did not occur to the same extent in the other

CHART II

MEAN MORTALITY FROM TUBERCULOSIS AT DIFFERENT AGES IN CATTARAUGUS COUNTY, NEW YORK STATE, COMPARED FOR 1916–1924 AND 1925–1926



three counties. Of even greater significance will be the results of an analysis of the case records which will show the extent and manner in which the disease has been prevented, arrested, and mitigated in comparison with previous years.

When we make our experiment specific, however, the results are measurable in a greater degree. The evaluation of attempts to prevent disease by reducing the opportunity for contact between the infecting organism and the susceptible individual has been frequently illustrated in the reduction of typhoid following the installation of pure water

supply. A newer illustration of the same kind is afforded in the prevention, or at least reduction, of milk-borne typhoid epidemics following increases in the percentage of pasteurized milk consumed. Here, let us note, is a clear instance of a *specific* objective (the prevention of milk-borne typhoid) attempted by a *specific* method (the elimination of the infecting organism from a known means of contact between the organism and individuals known to be susceptible), and the result is measurable in *specific* terms (the frequency of typhoid cases resulting from an infected milk supply). Bigelow and Forsbeck [1] have recently reported upon the Massachusetts experience in this particular. Although their data are not given in sufficient detail or in suitable form for applying those methods of appraisal which suggest themselves as desirable from a statistical point of view, the broad outlines are clear enough. Briefly stated, they are as follows: During the past 20 or more years an effort has been made to bring about pasteurization of milk supplies in that state with the result that in 1926 at least 58 per cent of the population were so protected. Although per capita milk consumption in towns and cities in 1926 was about the same as in 1919, 83 per cent of the milk supply was pasteurized in 1926 as against 74 per cent in 1923, and 34 per cent in 1919. The number of typhoid outbreaks and of typhoid cases traced to milk have shown a marked and consistent decline. The correlation is indicated by Table II.

TABLE II

MILK-BORNE TYPHOID AND MILK PASTEURIZATION IN MASSACHUSETTS *

Period	Typhoid traced to milk: Mean annual number of		Per cent of milk supply pasteurized (Urban)	Year
	Outbreaks	Cases		
1907–1914	6.3	278	Negligible	
1915–1918	4.0	124	10–25	
1919–1923	3.4	60	{ 34 { 74	1919 1924
1924–1926	3.3	27	83	1926

* Data from Bigelow, and Forsbeck, "Milk-Borne Disease in Massachusetts," *American Journal of Public Health*, October, 1927, p. 1019.

The measurement of the results of the country-wide campaign for immunization against diphtheria is desirable for several reasons. One is to find out whether or not it is having a significant effect upon the prevalence of the disease and upon the mortality from it. Another is to

[1] George H. Bigelow, and Filip C. Forsbeck, "Milk-borne Disease in Massachusetts," *American Journal of Public Health*, October, 1927, p. 1019.

ascertain how much immunization is needed in a population to prevent epidemics, since it is hardly possible to bring about universal immunization. Another is to concentrate the immunization work in population groups of certain races and ages where it will be most effective. Now obviously it will not be possible to judge of the results from the chronological records of incidence and mortality and of immunization alone. Some of our cities, for example, were visited by epidemics of unusual magnitude in 1919–22 and these epidemics may have had an unusual immunizing effect. On the contrary, artificial immunization has been chiefly among children of school age and has not been very extensive among the children born since these epidemics. Other conditions add to the complexity of the situation. It is entirely possible, however, to regard the artificial immunization work at each age as a separate experiment from year to year, and to record the results in the manner outlined in the example (Table III). The effect of lessened opportunity for control by reason of the reduction in cases is not, of course, evaluated by this particular procedure.

TABLE III

THE MEASUREMENT OF THE RESULTS OF DIPHTHERIA IMMUNIZATION IN PROVIDENCE, RHODE ISLAND, 1923–1925

Age	Number immunized *	Cases among immunized	Cases expected at rate among nonimmunized	Difference
	1923			
0 to 4	44	0	0	0
5 to 9	768	0	5	5
10 to 14	436	0	1	1
15 and over	27	0	0	0
	1,275	0	6	6
	1924			
0 to 4	150	1	1	0
5 to 9	1,543	1	9	8
10 to 14	1,101	0	2	2
15 and over	52	0	0	0
	2,846	2	12	10
	1925			
0 to 4	817	1	3	2
5 to 9	4,880	3	25	22
10 to 14	2,238	2	4	2
15 and over	74	0	0	0
	8,009	6	32	26

* Immunized includes all persons receiving three injections of toxin-antitoxin, disregarding retests. Data from Clarence L. Scammon and Alton S. Pope, "Diphtheria Immunization in Providence," *Journal of the American Medical Association*, February 19, 1927, 88, pp. 563–5.

To summarize: Except in rare instances, it will be possible to evaluate statistically the results of social experiments only when proper facilities for measurement are provided as an essential part of the experiment itself. This means that a social experiment ought to be "set up" on scientific principles, that is, planned, carried out, and observed in such a way as to permit evaluation of the extent to which its objectives are attained.

Public health, at least, cannot develop as a science unless the modes of science, such as the experimental method, are employed.

AN EXPERIMENT IN THE EVALUATION OF SOCIAL CASE WORK

By Porter R. Lee

At the present time no problem of social work is more insistent or more difficult than the problem of evaluating its results. As social work increases its own resources of knowledge and sharp definition of its problem, of sure-footedness and precision in its practice; as communities face rising costs for social work; as older established services, such as medicine, schools and industry, seek to incorporate some forms of social work within their own programs, the social worker asks himself more and more frequently, "How can we determine whether the results we are achieving justify the effort and cost involved and whether they realize our high professional expectations?"

This paper is an attempt to present the significance of a single effort to evaluate the results of one enterprise in the field of social case work. This effort at evaluation was faced with all the difficulties inherent in the measurement of results in social work, some of which need to be stated as a background for estimating the significance of the particular project which we are to discuss.

Social case work in all its forms deals with human beings whose capacity for self-maintenance among conditions of modern life has become impaired. In the course of its activity in behalf of such persons, social case work attempts to find employment, to deal with deserting husbands, to keep children in school, to insure medical attention to persons suffering from disease or physical defect, to provide material relief for persons without financial resources, to find foster homes for children without homes of their own, to exercise supervision over juvenile offenders placed on probation, to deal with the frames of mind which tend to produce or to perpetuate those unwholesome conditions in home life or unwholesome conduct on the part of individuals which may be factors in the impairment of their capacity for self-maintenance.

Assuming that among such items as these we can find by implication the objectives of social case work, it is clear that by the process of adding up certain items as they appear in those who seek the service of social case work, adding up other items which appear during the course of the treatment of such persons, and comparing the two, we may make use of the statistical method for purposes of evaluation which would give us a conclusion entirely valid so far as it goes. For

example, here is an agency whose function in the community is the finding of foster homes for children who have no homes of their own. During a six-months period, 189 such children are referred to the agency. At the end of the period, 110 of these have been placed in foster homes, the applications of 30 have been withdrawn, 12 have been sent to institutions instead and 37 are still in process of treatment but as yet unplaced. It is obvious that each of these four divisions of the present status of the 189 children can be established as fact and that the comparison of the figures regarding placement with the total number of children received for placement will enable us to state statistically the efficiency of the organization in regard to its one function of finding foster homes. Similar figures could be presented regarding a great many of the problems with which social case work deals and the results of the efforts of social case work to deal with them. Such data as these have, as a matter of fact, been prepared for years by reputable organizations in the case work field. They have been inadequately prepared and presented, in many instances, without that uniformity in the method of presentation which would permit desirable comparisons among agencies and desirable quantitative estimates of the incidence of certain problems throughout the whole field of social case work.

This method of stating the results of social case work, however, is increasingly distrusted because, despite its value so far as it goes, it is likely to be entirely misleading without some evidence of the effects upon the clients of the agency which the treatment items noted and added have produced.

To revert to our illustration, no agency whose function is the placing of children would regard the number of placements of children in foster homes as a test of its efficiency. A reputable agency in this field would be satisfied only with a test which indicated its success and failure in adapting the foster home solution to the specific requirements of the individual child. Such a test at once introduces elements which cannot at present at least be accurately measured. It would be almost impossible to classify children into groups representing useful different concepts of their foster home needs. It would be equally impossible to classify foster homes into groups representing different estimates of their potential contributions to the needs of specific children.

Until the data of adjustment can be accurately measured and mathematically added, purely quantitative methods have little value in testing the efficiency of the case work agency in the most responsible part of its task. Nevertheless, the acceptance in a given field of some

common standards of achievement and of some definitely established methods of work is an indication that within the minds of social case workers at any rate an evaluation process is going on. No reputable case work agency in these days justifies its work to the community solely in terms of its program. It tends constantly to substitute in its appeal for support faith in its results for faith in its program. An agency's faith in the results of its work in these days is not based altogether upon assumptions. It is based largely upon evidence of the value of its work, and such evidence is always the product of a certain evaluation process. The first attempt to get away from sheer faith in a program as justification of the work of an agency led to an attempt to show results largely in terms of illustrative cases. To be able to produce one successful case is in itself an evidence of success. Social agencies, however, long ago realized that their programs must stand or fall by the percentage of success in their work as a whole and they are now engaged in the effort to find ways of measuring total results rather than of indicating those results through the use of illustrative cases. Not much progress has yet been made, but we believe that we are at least in its path.

In 1921, the Bureau of Children's Guidance was established by the New York School of Social Work as a part of the Commonwealth Fund program in the prevention of delinquency, as a clinic for the study and treatment of children who present problems of conduct. The Bureau was established as an experiment limited in time and its operation ceased on June 30, 1927. The Bureau was assigned, also, certain functions connected with research and the training of students. Its intake of cases was deliberately limited to the number which could be handled with reasonable adequacy by the staff. Cases were accepted as they came except for this limitation and for the further limitation implied in our taking only cases in which there was a reasonable hope of securing parental interest in the treatment of the child.

During the five-year period, 822 children were accepted at the Bureau. Twenty-three proved to be cases requiring so slight a service that they were not counted among the cases treated, 116 were withdrawn by parents or other responsible persons before the end of treatment, 92 were dropped by the Bureau before treatment began. There were various reasons for dropping this group, including the removal of the family to a distance too great to make effective contact possible, the discovery by the Bureau before treatment began that there was no possibility of securing parental coöperation and, in some instances, the discovery that the children were of such low grade mentality as to be unsuitable for treatment at this type of clinic. This left 591 who

were carried through a period long enough to permit reasonably adequate treatment, in so far as adequacy of treatment is a matter of time.

When the Bureau was started there had been few experiments in the field of child guidance. Its establishment was justified, therefore, by faith in its program. From the beginning, faith in the program became supplemented in the minds of the staff first by faith in the Bureau's methods and later by faith in the Bureau's achievement. During the five years and a half of its operation, the staff of the Bureau (consisting of seven persons—three psychiatrists, a psychologist and three social workers) believed that their study of the cases under treatment and their familiarity with the results of the treatment furnished ample evidence on which to base faith in the Bureau's results. The appearance of this evidence was something more than a by-product of the activities of the staff in the treatment of children. It was largely the result of a process which was essentially an evaluation process continuously going on in the minds and in the discussion of the members of the staff. As such, it was not unlike the inchoate, unstandardized and non-precise evaluation methods which are at present characteristic of the field of social case work as a whole.

In preparation for the final report, the staff decided to attempt a more methodical, dependable evaluation. The objectives of the Bureau in each of the 591 cases carried through the treatment period could be stated as emotional adjustment of the child through better understanding of his problem. The attainment of this objective implied a change in his own attitude and changes in the attitudes of his parents and his teachers, with resulting changes in the active relationships between the child on the one hand and his parents and teachers on the other.

Our effort in evaluation took the form of classifying cases which had been under treatment as having resulted in successful adjustment, partially successful adjustment or in complete failure in adjustment. The statistical difficulties presented by such a project are at once apparent. What do we mean by adjustment? It is a matter of judgment and there are no perceptible gradations between complete adjustment, however defined, and partial adjustment and so on down the line to complete failure in adjustment. We, therefore, abandoned any idea of a precise measure of the success of the Bureau and confined ourselves to an effort to study the cases under treatment in such a way as to give us the most substantial basis possible for a judgment by the staff regarding the Bureau's success.

This project was carried out through a special study by the whole staff of all of the cases numbered from 200–299 in the Bureau's files,

representing its work during the earlier stages, and all of the cases numbered from 500–699, representing the work of the Bureau in its later stages. In this group of 300 cases, there were 196 which had been carried through the treatment period. The Bureau's data on these cases were compiled in three separate forms of record, all of which were considered both in treatment and in the staff evaluation. The first compilations were the case records themselves, which were unusually complete. The second compilations were certain diagnostic and progress sheets which were kept currently in the treatment of the cases and recorded briefly the problems defined by the staff, the treatment undertaken and the progress or lack of progress noted. The third was a special analysis in which all of the data regarding the patient and his environment were classified so as to indicate whether each item in his history as we had become aware of it seemed to have either a favorable or unfavorable significance in the problem of his adjustment. Each of the 196 cases was reviewed by the staff in the light of these compilations of data and in the light, also, of their acquaintance with the case and, as a result of the review, each case was classified as successful, partially successful or failure.

We next gave consideration to possible ways of checking this judgment of the staff. It seemed to us that if a parallel judgment made by the parents of the children concerned could be secured, it would have checking value. It seemed likely that there would be checking value, also, in an analysis of the judgment of the teachers of such children as were in school. It would be possible, also, to tabulate the symptomatic behavior of the children when they appeared at the clinic—for instance, such items as temper tantrums, anxiety, wakefulness, thumb sucking, lying, etc.—and to compare this with a similar tabulation of behavior at the end of treatment. Other checks on the original staff judgment would have been possible, none of them conclusive in themselves but collectively seeming to furnish a substantial basis for judging the results of the Bureau's work.

Unfortunately, the limitation of time, prior to the closing of the Bureau, permitted the undertaking of only one of these studies and that only in a limited way. We made an effort to secure from the parents of the children in the group of cases numbered 600–699 an estimate of the progress their children had made during the period of treatment. In this group there were 71 cases which had been carried through the treatment period, all of which had been included in the staff appraisal. In 10 of these it was not possible to interview the parents. In some instances this was because they had moved and we had no records of their addresses. In other cases the children

were in institutions, sometimes as part of the Bureau's treatment, and while the parents were aware of their progress they had no first-hand evidence of their own on which to base a judgment. There remained 61 children in this group whose parents were interviewed by one person, a competent social worker trained in mental hygiene but not a member of the staff and, therefore, not a party to the staff appraisal of these cases. The data resulting from these interviews were considered by this worker in consultation with some other persons, not including members of the staff, and interpreted by her as indicating the judgment of the parents regarding the successful or unsuccessful adjustment of their children. These interviews varied in length, but they were all long enough to give a careful worker a sense of the parents' point of view. This point of view was then translated by the worker into terms of success, partial success or failure with respect to the child's adjustment.

The result of the staff appraisal of the 196 cases carried through the treatment period was as follows:

Success	93	48 per cent
Partial Success	61	31 " "
Failure	42	21 " "
Total	196	100 " "

The results of the two appraisals, by the staff and by the families, in the 61 cases involved in both studies were as follows:

Staff Appraisal	Family Appraisal			Total
	Success	Partial success	Failure	
Success	23	7	3	33
Partial success	11	9		20
Failure		5	3	8
Total	34	21	6	61

These two studies seem significant to the staff for two reasons. First, we think they carry us a step beyond faith in our program and illustrative cases as a basis for faith in our results. I should be willing to suggest that the Bureau was successful in approximately 48 per cent of its cases, partially successful in about 31 per cent and failed in about 21 per cent with rather more confidence than I could have felt regarding any estimate in terms of percentages without these two studies. Second, the check furnished by the study of the point of view of the parents seems enlightening. It suggests the possibility of arriving at

a still more dependable conclusion regarding the work of the Bureau by undertaking some of the other studies already suggested. We have still far to go before we shall have developed any dependable measurements of the data of adjustment. In the meantime I am inclined to think we may, through cumulative evidence from such varied sources, be furnishing another valid method of determining results of social case work.

At this point certain comments are in order. Whether these simple tabulations have any significance for the statistician, I do not know. Their significance for the social case worker, however, needs to be interpreted. The first question that arises in my mind regarding them is: Taking them at their face value, whose success or failure do they indicate? Again taking them at their face value, we can say with some confidence that 591 children when they first appeared at the Bureau presented serious conduct problems, traceable largely to emotional factors, and that at the end of the period of treatment in 48 per cent of these cases there had been a successful adjustment on the part of child, parents and teachers, in 31 per cent of the cases there had been a partially successful adjustment, and in 21 per cent of the cases there had been a complete failure to adjust. Within the experience of every member of the staff of the Bureau and, very likely, within the experience of every member of this audience, children quite as disturbed emotionally as those who came to the Bureau have achieved what the Bureau staff would regard as successful adjustment without the aid of a child guidance clinic and, indeed, possibly without the deliberate aid of any other person. How many of these Bureau children would have achieved successful or partially successful adjustment had they never been brought to the Bureau? We do not know. How many of the failures would have achieved successful adjustment except for the effort of the Bureau in their behalf? We do not know. If we concede, nevertheless, a large amount of credit to the Bureau for its work, as we do, it still remains true that in practically all of the successful or partially successful cases these adjustments were obtained largely through the coöperation of the parents and teachers. In some cases this coöperation has been so intelligent and faithful as to make the parent seem to be the most important factor in the outcome. Whatever success or failure these figures indicate must be regarded as success or failure on the part of children to adjust, with the Bureau as one factor and, as we believe, the leading factor in the result. We find significance in the fact that in most cases the Bureau was the only new factor in the situation after the appearance of the child at the clinic and that practically every other agency and person

who continued an interest in the child during the period of treatment had previously made an unsuccessful effort of some kind to deal with him and his problem.

The second comment is that the judgments through which these evaluations were made were ex-parte judgments working with subjective data. The staff appraisal was made by the group which did the work and the group which had the greatest stake in the results of the whole experiment. The parents' judgment of the children's progress was made by the group having the greatest stake in the child himself, and the group, moreover, closest to his situation. Furthermore, as recorded in the tabulations, the judgment of the parents appears as it was interpreted by another person. To a disinterested person, therefore, wishing to know to what extent the Bureau of Children's Guidance was successful, this tabulation would have as much value as he was willing to concede to the credibility and objectivity of the groups which made them. The figures in themselves, in my judgment, carry no significance whatever. They have significance only in the light of the credence to be attached to the self-appraisal of a particular group of workers.

One further comment should be made. These appraisals were undertaken prior to the closing of the Bureau. They were conclusive, so far as such things can be conclusive, as of the dates when they were made. Recent information regarding some of these cases would change the classifications. Some failures are now apparently successes. Some successes are now apparently failures. This, however, in my judgment, would be the fate of any classification of results based upon the data of human adjustment.

From the point of view of the general problem of evaluating results of social experiments, I believe this particular project has this much significance. In so far as such experiments are dealing with data which are not yet susceptible to accurate measurement, indications of the quality of results must be largely in terms of the judgment of individuals. This particular experiment would seem to indicate that the cumulative judgments of different persons in a position to form a judgment may be both significant in character and possible of tabulation.

EFFECTIVENESS OF LIFE IMPRISONMENT AS A REPRESSIVE MEASURE AGAINST MURDER IN RHODE ISLAND

By Harold A. Phelps

According to a generally accepted opinion of many writers on criminal law, every violation of a law is an indication of its failure to repress crime. If there is any truth in this assumption, every violent act resulting in homicidal death is an indication of the failure of punishment, whether the punishment be life imprisonment or the death penalty.

During the period under consideration in this paper, the life sentence has been the maximum penalty for murder in Rhode Island, and in Massachusetts, which is used for purposes of contrast, the maximum punishment has been the death penalty.

There are three sources of information concerning the number of murders in any community. These are the homicide rate, the number of indictments for murder coming before the Superior Courts, and the number of convictions for murder. Though each of these sources affords a slightly different approach to the problems of murder, together they serve well to indicate the numerical problem that murder presents to our police and court organizations.

The homicide rate shows the actual loss of life from criminal violence. There has been some adverse criticism of the homicide rate as an index of murder. However, with the adoption of the "International Classification of Causes of Death," the term "homicide" includes what we ordinarily consider murders, namely homicide by firearms (182), by cutting or piercing instruments (183), and by other means, such as poison and strangulation (184). In addition, infanticide (200, the murder of infants less than one year of age) is included in the homicide rate in this study.

Data concerning homicides are available in Rhode Island and Massachusetts from the middle of the last century. These states are compared because of their similarity. In both states there has been a steady increase in the homicide rate, the rate in Massachusetts being on the average slightly in excess of the homicide rate in Rhode Island.

A seven-year moving average gives a good summary of this increase. In Rhode Island where the population is relatively small and the number of homicides is also small and fluctuating, there are two distinct tendencies over the entire period. From 1860 to 1896 the homicide rate maintained a fairly low level (varying from a maximum of

1.7 per 100,000 population to a minimum of 0.3 per 100,000 population) and showing no marked increase. From 1897 to the present there has been a similar uniformity in the homicide rate but at a higher level (varying from a maximum of 3.1 per 100,000 population to a minimum of 2.1 per 100,000 population.)[1] In Massachusetts this increase has been more uniform over the entire period, varying from a maximum of 3.7 per 100,000 population to a minimum of 1.0 per 100,000 population.[2] Using the moving average as a basis of comparison Rhode Island with the exception of 14 years has always had a smaller homicide death-rate than Massachusetts.

A straight line, fitted to both series, provides a good indication of the general movement of the homicide rate and of the annual increase. This increase in Rhode Island is .034 and in Massachusetts .032, the series in Massachusetts following a straight line trend more closely than the Rhode Island series because of the fluctuations in the latter. Due to these fluctuations neither the mean [3] nor the probable error of the entire series is a good summary value. The summaries for the last 10 years are undoubtedly of greater significance for present purposes. During the last decade in Rhode Island the mean rate was 2.16 per 100,000 population with a probable error of ±.41, and in Massachusetts the mean rate was 2.7 per 100,000 population with a probable error of ±.33. If the present tendencies in the homicide rates continue for the next decade, Rhode Island will have a homicide rate increasing to 3.5 per 100,000 population and Massachusetts will have a homicide rate increasing to 3.6 per 100,000 population. Or in terms of variability the homicide rate in Rhode Island for 1936 will probably occur within the limits of 3.0 to 3.9 per 100,000 population, *i. e.* from 23 to 30 homicidal deaths, and in Massachusetts from 3.4 to 4.1 per 100,000 population or from 181 to 218 deaths.

So far as the homicide rate itself is concerned with the problems of murder, we may conclude that there has been a fairly constant increase in homicidal deaths in Rhode Island from 1852 and in Massachusetts from 1850. Since this increase has continued for over 30 years after both states were accepted in the death-registration area, we may conclude in addition that this increase is an actual one and not due to more careful records.

[1] Rhode Island: Maximum number of homicides, 23
Minimum " " " 0

[2] Massachusetts: Maximum number of homicides, 144
Minimum " " " 10

[3]

Rhode Island		Massachusetts	
Mean 1.9 (1860–1927)	P. E. ±.74	Mean 2.3 (1859–1926)	P. E. ±.57
" 2.7 (1897–1927)	" ±.44	" 2.7 (1910–1926)	" ±.33
" 2.6 (1917–1927)	" ±.41		

Judicial records serve two purposes with respect to the problems of murder. First, they are useful as a check on the homicide rate, showing according to the date of arraignment the trend of homicidal violence. Secondly, they indicate the activity of the police and courts as repressive agencies. Judicial records, either the records of indictments or of convictions for murder, do not include murders settled by the police or murderers who are undetected or who commit suicide. Consequently they are considerably less than the number of homicides for any period. In this connection and in order to achieve more complete judicial records, it has been urged frequently that a record of complaints of types of crime would be a better indication of the frequency of crime than any record now available.

In both Rhode Island and Massachusetts there has been a steady increase in the number of persons indicted for murder from 1896 to the present. The disposition of criminal cases by the courts can be traced no further than 1896, because the records are not accurate. Like the homicide rate, there are marked fluctuations in the number of indictments for murder per 100,000 population. The indictment rate for Rhode Island is based upon the records of two counties, Providence and Bristol, since these records only could be distributed by years. They represent primarily the incidence of murder in an urban environment, over 80 per cent of Rhode Island's population residing in these two counties and 84 per cent of the murder cases in the state since 1896 having occurred here. Indictment rates in Rhode Island, reduced to a three-year moving average, show a constant increase from 0.5 per 100,000 population in 1897 to 1.9 per 100,000 population in 1925 or in absolute numbers from 3 to 12 indictments. This increase was very regular to 1912. From 1912 to 1920 there was a more rapid increase, reaching its peak in 1916 with a rate of 2.5 per 100,000. From 1920 to 1922 inclusive there was a considerable decrease in the number of indictments and also in 1925; in the other years after 1919 the regular increase occurred. With the exception of this increase and decrease from 1912 on, the indictment rate corresponds very well with the homicide rate. In Massachusetts a similar increase in the indictment rate for murder is shown by a three-year moving average, varying from a minimum of 0.3 per 100,000 population in 1897 to a maximum of 0.9 per 100,000 population in 1914 or in absolute numbers from 9 to 43 indictments. As this rate for Massachusetts represents the entire state, there are fewer fluctuations than in the Rhode Island rate. Its increase also corresponds fairly well with the homicide rate. Unfortunately the number of indictments for murder by the Superior Courts of Massachusetts could not be con-

tinued to the present because of changes in the prison reports. However, to substantiate this increase noted from 1896 to 1916 in Massachusetts, there are records of murder cases in the lower courts from 1882 to 1926. A five-year moving average of these rates per 100,000 population shows a constant increase in the number of murders, from 1.4 in 1884 to 3.0 in 1923, with the tendency previously noted in the Rhode Island figures to increase rapidly from 1912 on with a slight decrease from 1918 to 1920 inclusive.

Indictment rates for murder in the two states confirm the tendency, already revealed by the homicide rate, toward an increase in the amount of violent crime that results in death.

The third source of information, the number of convictions for murder, furnishes a distinct contrast to the homicide and indictment rates. Since our study is concerned with the repressive influence of maximum penalties, convictions for murder in the first or second degrees constitute the data of conviction rates. In both states the rate of convicted murderers per 100,000 population from 1896 to the present does not show any increase corresponding either to the homicide or indictment rates. With slight fluctuations this rate has varied in Rhode Island from a minimum of .05 convictions in 1906 to a maximum of 0.9 convictions in 1918 or in absolute numbers from 1 to 7 convictions, and in Massachusetts from a minimum of 0.2 convictions in 1898 to a maximum of 0.6 convictions in 1913 or in absolute numbers from 4 to 26 convictions. The mean rate of convictions over the entire period was practically the same in both states (.39 in Rhode Island and .38 in Massachusetts), roughly .4 per 100,000 population, which signifies little as to the relative efficiency of courts in obtaining convictions under either extreme penalty. Though these are the actual murder rates, they indicate definitely that many murders in fact are not murders in law.

The effectiveness of life imprisonment or of the death penalty as repressive measures against murder can only be maintained so long as offenders are convicted, and convicted murderers are obliged to serve their sentence. There is positive evidence that the penalties against murder are not effective measures against the types of offenses leading to homicidal deaths both in the increasing homicide rate and in the increasing indictment rate for murder. Failure of the courts to convict indicted murderers in the first or second degree is a second evidence of their ineffectiveness, and a third source of evidence is the actual sentence served by convicted murderers in prison, which takes into consideration the pardon or parole of convicted murderers.

The value of the court as a repressive agency may be determined by

an analysis of the disposition of all murder cases or by a comparison between these dispositions and the total number of homicidal deaths. In Rhode Island from 1896 to 1927 there was a total of 211 defendants charged with murder, of whom roughly 30 per cent (30.8 per cent) were convicted of murder in the first or second degree, 30 per cent (31.3 per cent) were convicted of manslaughter, and 30 per cent (29.9 per cent) were found not guilty or the cases were incompleted. The latter were really incompleted in the sense that they would never be convicted, being disposed of under the captions, capias ordered and issued, nol prossed, jury disagrees, bail, pending and deferred sentence. In Massachusetts from 1896 to 1916 there were 405 defendants charged with murder, 43 per cent of whom were convicted in the first or second degrees, 20 per cent were given a long term, and 23 per cent were found not guilty or the cases were incompleted. In both comparisons the remainder were convicted on minor charges or were found not guilty due to insanity. More refined comparisons are not permitted, because of the form in which the Massachusetts records are summarized. Limiting our attention to convictions in the first degree in Rhode Island and for the death penalty in Massachusetts, a more clear-cut summary of judicial procedure may be secured by a comparison with the total number of homicides. There were during these periods in both states approximately 4 persons indicted for every 10 homicidal deaths, and of these indicted murderers 1 in every 10 was given the life sentence in Rhode Island and 1 in every 20 was given the death penalty in Massachusetts. So far as repression or deterrence of violence through court action is concerned, the infrequency with which either penalty is used is a pretty good indication of their limits as repressive measures.

Prison records demonstrate the actual punishment for murder and are available in Rhode Island since the opening of the prison in 1838. During this time 236 persons have been imprisoned for violent crimes that have resulted in homicide. Of this number 32 per cent were given the life sentence, 17 per cent was given a sentence in the second degree (which has only been available to the courts since 1915) and 51 per cent were convicted of manslaughter. Of the persons sentenced to life imprisonment one-half were pardoned after serving on the average 13 years, one-fourth served their sentence an average of 10 years, and one-fourth are still in prison. Making an allowance for recent admissions in the case of persons convicted of second-degree murder and of manslaughter, slightly more than one-half of the persons convicted of these offenses have been released by pardon or parole after serving on an average of 5 years. The average sentences given for

second-degree murder and for manslaughter are 18.9 years and 8.3 years respectively. A summary of these prison records shows quite definitely that the maximum penalty for murder in Rhode Island is on the average considerably less than life and that the prison terms for homicidal killing for which a sentence of less than life is given are correspondingly reduced.

TABLE I

DISPOSITION OF MURDER INDICTMENTS BY THE SUPERIOR COURTS OF RHODE ISLAND, 1896–1927

	Providence and Bristol Counties	Newport County	Kent County	Washington County	Total
Number of murder cases	150	11*	12	13*	186
Number of individuals	178	10	12	11	211
Murder, first degree	21	2	..	3	26
Murder, second degree	33	3	..	3	39
Manslaughter	54	4	6	2	66
Assault	2	..	..	..	2
Not guilty	18	..	2	1	21
Not guilty, insanity	11	1	1	2	15
Nol pros	10	..	..	..	10
Capias ordered	15	..	2	..	17
Jury disagrees	2	..	..	..	2
Deferred sentence	3	..	..	..	3
Bail	9	..	..	..	9
Pending	..	..	1	..	1

* One individual is charged with two murders but tried for only one offence.
Source: Docket and Indictment Records of the Superior Courts.

TABLE II

DISPOSITION OF MURDER INDICTMENTS BY THE SUPERIOR COURTS OF RHODE ISLAND AND MASSACHUSETTS

	Rhode Island, 1896–1927		Massachusetts, 1896–1916 *		
	Number	Per cent	Number		Per cent
Total number of defendants	211	100.0		405	100.0
Murder, first degree	26	12.3	(Death)	23	5.7
Murder, second degree	39	18.5	(Life)	150	37.0
Manslaughter	66	31.3	(Long term)	81	20.0
Minor convictions	2	0.9		19	4.7
Not guilty	21	9.9		38	9.4
Not guilty, insanity	15	7.1		40	9.9
Incompleted	42	20.0		54†	13.3

* Due to a revision in the prison reports of Massachusetts, the data for the years after 1916 are not available. The captions in parentheses indicate the terminology of these reports.
† Incompleted cases include cases pending, nol prossed, on file, and died before indictment.

TABLE III

TOTAL COMMITMENTS TO THE RHODE ISLAND STATE PRISON, 1838–1927

	Males	Females	Totals	Per cent
Murder, first degree	71	5	76	32.2
Murder, second degree	39	..	39	16.5
Manslaughter	116	4	120	50.8
Accessory to murder	...	1	1	0.5
Totals	226	10	236	100.0

TABLE IV

DISPOSITION OF PRISONERS CONVICTED OF FIRST-DEGREE MURDER, RHODE ISLAND, 1838–1927

	Males	Females	Totals	Per cent
Pardoned	36	1	37	48.7
Expiration of sentence	1	..	1	1.3
Died	17	2	19	25.0
Now in prison	14	..	14	18.4
Insane	3	2	5	6.6
Totals	71	5	76	100.0

TABLE V

DISPOSITION OF PRISONERS CONVICTED OF SECOND-DEGREE MURDER, RHODE ISLAND, 1915–1927

	Males (totals)	Per cent
Now in prison	23	59.0
Pardoned	8	20.5
Paroled	6	15.4
Died	2	5.1
Totals	39	100.0

TABLE VI

DISPOSITION OF PRISONERS CONVICTED OF MANSLAUGHTER, RHODE ISLAND, 1838–1927

	Males	Females	Total	Per cent
Expiration of sentence	46	2	48	40.0
Pardoned	30	1	31	25.8
Paroled	18	..	18	15.0
Now in prison	12	1	13	10.8
Died	6	..	6	5.0
Insane	4	..	4	3.3
Totals	116	4	120	99.9

Source: Rhode Island State Prison records of admissions and releases.

CONCLUSIONS

1. There is no evidence, statistical or other, that the penalties of life imprisonment in Rhode Island or death in Massachusetts have been successful repressive agencies against crimes of violence that result in homicidal deaths.

2. Summarizing the data concerning homicides and indictments for murder in both states, there are distinct indications that murder is on the increase.

3. When the murder rate, *i. e.* the actual number of convictions, is compared with either the number of homicides or of indictments, there

is a marked discrepancy between them. This failure of the courts to convict and the early release from prison of over one-half of the convicted murderers constitute a practical difficulty in the administration of either penalty.

There is no impressive testimony in the experience of either state that life imprisonment or the death penalty have unique repressive values. One of the most confusing aspects of this type of problem is the subjective character of murder, types of killing that resemble each other very closely being defined by the courts as murder in some cases or as no legal crime in others for extremely adventitious reasons. In addition the fluctuations from year to year in the homicide and indictment rates indicate well the accidental nature of homicidal deaths and of murder. It is this accidental character of the majority of violent crimes, together with the administrative difficulties involved in getting convictions, that make either life imprisonment or the death penalty ineffective preventives of murder.

MINUTES OF THE ANNUAL BUSINESS MEETING

The first session of the Annual Business Meeting of the American Statistical Association was held at the Hotel Washington, Washington, D. C., on December 28, 1927, at 9.00 A.M. The meeting was called to order by President Edmund E. Day.

Professor Robert E. Chaddock, Chairman of the Committee on Nominations, reported the following nominees for officers for the year 1928:

President, Carl Snyder
Vice-Presidents, Seymour L. Andrew, Raymond Pearl, Ralph G. Hurlin
Counsellors, James W. Glover, W. Randolph Burgess, R. H. Coats
Secretary-Treasurer, Willford I. King
Editor, Frank A. Ross

A motion was carried instructing the President to cast the unanimous ballot of those present for the candidates nominated.

The report of the Secretary was read by Willford I. King, the present incumbent. A motion was carried to accept the report.

Willford I. King also made the report as Treasurer. A motion was carried to place the same on file pending the receipt of the report from the Auditing Committee.

The Editor of the JOURNAL, Dr. Frank A. Ross, made his report for the year. A motion was carried to accept the report.

A report for the Committee on Advertising was made by Willford I. King.

The report of the Committee on Social Statistics was given by Ralph G. Hurlin. A motion was carried to place the report on file.

The following amendments to the constitution were proposed and a majority of those present voted in favor of a motion to adopt them. These amendments are, therefore, to be presented at the next Annual Meeting for final action.

Article VIII is to be amended to read as follows:

> Article VIII. The officers of the Association shall be a President, six Vice-Presidents, a Secretary, a Treasurer, and an Editor. Each Vice-President shall represent a distinct field of statistical interest. These officers shall be elected every year beginning with the first Annual Meeting succeeding the adoption of this constitution, in the manner prescribed by Article IX and shall take office at the close of the Annual Meeting at which elected. The President, Vice-Presidents, Secretary, Treasurer and the person or persons holding the Presidency of the Association during the two preceding years, shall form a Board of Directors for the government of the Association, three of whom shall constitute a quorum at any meeting regularly convened.

Article IX shall be amended to read as follows:

> Article IX. The President, Vice-Presidents, Secretary, Treasurer, and Editor, shall be elected in the following manner: The President shall appoint a Nominating Committee of three members, the personnel of which shall be announced in the quarterly publications of the Association at least three months before the Annual Meeting. It shall be the duty of the Nominating Committee to make nominations for officers to be elected at the Annual Meeting, and to notify the regular members and fellows by mail of its nominations at least thirty

days before the Annual Meeting. Twelve or more regular members or fellows may make nominations for any office by submitting signed petitions to the Nominating Committee at any time after the appointment of the committee and up to the time of the Annual Meeting, but this shall not prevent the committee from making additional nominations for the same office.

If no nominations by petitions are submitted for any office, the nominee of the Nominating Committee may be elected at the Annual Meeting by *viva voce* vote. If there are additional nominations by petitions for one or more offices, it shall be the duty of the Nominating Committee to announce such nominations, the election for such office or offices shall be by ballot, and the President shall appoint three judges of election who shall count the ballots, shall decide any questions that may arise as to the validity of any ballot, and shall declare the results of the election. The candidate for President, or for Secretary, or for Treasurer, or for Editor, receiving a plurality shall be declared elected, while the six candidates for Vice-President receiving the highest number of votes shall be declared elected.

A motion was carried instructing President Edmund E. Day to collaborate with the Committee on the Social Science Research Council in the matter of selecting cases for inclusion in the Handbook being prepared by that Committee of the Social Science Research Council.

The meeting adjourned.

The second Annual Business Meeting was called to order by President Edmund E. Day at the Hotel Washington, Washington, D. C., on December 29, 1927, at 9.00 A.M.

Reports made by the persons specified for the committees named were in all cases accepted and filed.

Report of the Committee on Governmental Labor Statistics, made by Miss Mary van Kleeck.

Report of the Committee on the Encyclopedia of the Social Sciences, made by Miss Mary van Kleeck.

Report of our Representatives on the Advisory Committee of the Census, made by Dr. W. S. Rossiter.

Report of the Committee on Institutional Statistics, made by Dr. Horatio M. Pollock.

Report of the Committee on Membership, made by Mr. E. W. Kopf.

Report of the Committee on Classification of Members, made by Mr. E. W. Kopf.

Report of the representatives of the American Statistical Association on the Social Science Research Council, made by Dr. H. L. Rietz.

Dr. Joseph A. Hill, Chairman of the Committee on Fellows, reported the election of the following persons as Fellows in the American Statistical Association: Dr. Seymour L. Andrew, Chief Statistician of the American Telephone and Telegraph Company; Professor Lowell J. Reed, Johns Hopkins University; Dr. Walter W. Stewart, Advisor to the Bank of England.

The following resolutions were adopted:

Be it resolved that the thanks of the American Statistical Association are hereby tendered to the Russell Sage Foundation for the very substantial support given to committees of the Association in their work and for the contribution of $100.00 to the general activities of the Association.

Be it resolved by the American Statistical Association that the thanks of the Organization are hereby tendered to Dr. H. G. Moulton of the Institute of Economics and to Dr. Dorsey W. Hyde, Jr., of the Washington Chamber of Commerce, as well as to the other members of the Committee responsible for the satisfactory arrangements made for the entertainment of the American Statistical Association at the Washington meeting.

Resolved by the members of the American Statistical Association assembled at the Annual Meeting that it is their desire to congratulate President Edmund E. Day on the very effective program prepared under his direction and to express their appreciation of his able administration throughout the year.

A resolution regarding the curtailment of the reports of the Bureau of the Census on Mortality was presented by Mr. E. W. Kopf. A motion was carried to refer it to the Board of Directors with power to act.

A resolution offered by Dr. Royal Meeker concerning the proposed new Cost of Living survey by the Bureau of Labor Statistics was also referred to the Board of Directors with power to act.

A motion was carried to instruct the Committee on Institutional Statistics to study the proposals made by Dr. Carl McCombs and, after studying these proposals, to report such recommendations, as the Committee may desire, to the Board of Directors of the American Statistical Association.

The meeting adjourned.

WILLFORD I. KING, *Secretary*

REPORTS

Report of the Secretary

The net gain in membership in 1927 was very satisfactory, being even larger than in 1926.

Membership, December 1, 1926			1,520
Additions during 1927		343	
Deductions during 1927:			
Deaths	11		
Resignations	26		
Dropped because unable to locate	9		
Dropped for non-payment of dues	61		
		107	
Net gain in membership during 1927		236	236
Membership, December 1, 1927			1,756

Besides members we have:

Subscribers, mostly libraries	427	
Domestic exchanges	16	
Foreign exchanges	22	
		465
Total members, subscribers, and exchanges		2,221

The following deaths were reported during the year:

Mr. Charles H. Angell
Mr. Rudolph Diamant
Professor James A. Field
Mr. William S. Haimes
Mr. Joseph E. Hitchcock
Mr. Arthur C. Keller
Mr. William H. Porter
Dr. Friedrich M. Schmidt-Ernsthausen
Mr. Gershom Smith
Dr. Antonio Stella
Mr. Charles J. Stevenot

Four numbers of the JOURNAL, containing 550 pages in all, have been issued during 1927. This composes Volume XXII.

There were 35 pages of paid advertising in the four issues. The Ronald Press Company favored us with a contract for one page per issue for a period of five years. Most of the other contracts are for one year.

We have experimented with the selling of selected Macmillan books to our members at reduced rates and, besides benefiting the members, the Association has made a small net profit.

In addition to the district organizations already in existence, Professor C. B. Simmons has established a branch in Austin, Texas.

Mr. S. W. Russell of Swift and Company has succeeded Professor James A. Field, who died July 15, as District Secretary of the Chicago Chapter.

Mr. A. Heath Onthank is succeeding Mr. H. G. Weaver as District Secretary of the Detroit Chapter of the Association.

Professor F. L. Carmichael has succeeded Professor John H. Cover as District Secretary of the Denver organization. Professor Cover is now in Pittsburgh, where he is coöperating with Mr. C. B. Metzger, our Secretary for that district.

As yet it has not been possible to revive the Philadelphia Local Organization.

We have reports of meetings held by district organizations, as follows:

Chapter	*Number of Meetings*	*Average Attendance*
Chicago	1	43
Cleveland	7	23
Columbus	7	22
Columbus, Ohio, Conference of Statisticians	2	
Denver	weekly	25
Los Angeles	8	14
New York City	5	148
San Francisco	4	

WILLFORD I. KING, *Secretary*

Report of the Treasurer, Covering the Period December 1, 1926, to December 1, 1927

Total cash not in savings banks, December 1, 1926	$ 161.33	
Cash in Bowery Savings Bank, December 1, 1926	3,439.09	
Cash in Emigrant Industrial Savings Bank, December 1, 1926	2,100.00	
Total		$5,700.42
Net Cash Receipts		
Individual membership dues	$8,434.25	
Corporate membership dues	400.00	
Life membership dues	75.00	
Subscriptions to JOURNAL	2,099.68	
JOURNAL sales	1,061.14	
Memorial Volume sales	70.00	
Advertising in JOURNAL	736.34	
Interest on savings*	504.07	
Dividends	148.75	
Gain from New York meetings	323.59	
Sale of Macmillan Company books to members	455.10	
Payments by authors for reprints	456.35	
Contributions from members for publication of supplement	25.00	
Total receipts		14,789.27
Total		$20,489.69

* Including $160.34 accrued in 1926.

Net Cash Expenditures

Cost of JOURNAL:		
Handbook for 1926	$ 329.98	
December, 1926, edition, including reprints	1,434.30	
March, 1927, edition, includng reprints	1,226.79	
June, 1927, edition, including reprints	1,376.59	
September, 1927, edition, including reprints	1,319.72	
Postage, stationery and miscellaneous printing	1,079.72	
Salaries	5,490.11	
Rent	258.25	
Telephone and telegraph charges	66.17	
Furniture and equipment	269.85	
Annual meetings	230.49	
Contribution to the Committee on the Encyclopedia of the Social Sciences	80.00	
Macmillan Company for books sold to members	247.84	
Shipping and caring for JOURNALS	57.92	
JOURNALS bought back	9.00	
Miscellaneous expenses, Secretary's office	109.56	
Miscellaneous expenses, Editor's office	133.45	
Total expenditures		$13,719.74
Cash in Checking Account, Bowery and East River National Bank, November 30, 1927	$ 78.51	
Cash on hand, not deposited, November 30, 1927	48.28	
Cash in East River Savings Bank, November 30, 1927.	6,279.81	
Cash in Emigrant Industrial Savings Bank, November 30, 1927	363.35	
		6,769.95
Total		$20,489.69
Total cash expenditures, excluding New York meetings		$13,719.74
Direct expenses, New York meetings		1,374.04
Direct expenses, including New York meetings		$15,093.78

Functional Apportionment of Expenditures

(Including Overhead)

Annual meetings and New York meetings	$2,987.77	
JOURNAL	8,562.32	
Employment Clearing House	706.04	
New members	818.78	
Miscellaneous	1,839.87	
		$14,914.78
Miscellaneous credits*		179.00
Total		$15,093.78

* Made up of miscellaneous refunds and gain from the sale of Macmillan books to members.

On December 1, 1927, the Association possessed in addition to stationery and miscellaneous supplies, the following assets:

17 shares of Boston and Albany stock, market value, December 1	$3,060.00
Furniture carried at	557.59
Accounts receivable (unpaid advertising)	215.50

JOURNALS, 6,646 copies.
Memorial Volume, 148 copies.
There were no bills outstanding.
Profit on the Memorial Volume to date has been $52.53.

WILLFORD I. KING, *Treasurer*

Report of the Editor

During the past year we have had the difficult task of printing the most valuable of the Annual Meeting papers and at the same time of doing justice to the new contributions received in the regular way. This was solved by printing a larger *number* of articles and featured notes per issue, though keeping the total pages approximately the same as in recent years. In consequence the year's budget has been adhered to.

A different solution has been worked out for next year. The Board of Directors has authorized the issuance of a volume of PROCEEDINGS to contain the papers delivered at the Annual Meeting. These PROCEEDINGS will be mailed under the same wrapper as the March issue. The entire program will be included, though obviously it will be impossible for financial reasons to print *all* papers in full. At least for the coming year it will be necessary to cut down the number of pages in the several regular issues, in order partially to make up for the extra cost of the PROCEEDINGS.

The Editor wishes to express his gratitude to Dr. Leo Wolman for his splendid contribution to the JOURNAL in conducting the Reviews Department. All of us are deeply indebted to those who have so carefully and thoroughly analyzed the important books of the year under his direction. Mention also must be made of the splendid aid given by the members of the Board of Editors.

With the development of many local chapters of the Association throughout the country, the synopses of papers delivered at their various meetings are becoming an important part of our publication program. We hope to give prompt and fairly detailed presentation of these in the several issues of the ensuing year.

For some time we have been very much dissatisfied with the Recent Literature section. All planning has been postponed pending the action of the Social Science Research Council's Committee on Social Science Abstracts. It now appears that an ABSTRACT JOURNAL will be issued monthly to serve, among others, the members of the Statistical Association. This will materially modify the Recent Literature section.

It is hoped that several developments can be launched before the next Annual Meeting which will make the JOURNAL more valuable to its readers. The Editor will be glad to receive suggestions from members as to how the usefulness of the JOURNAL can be increased.

FRANK A. ROSS, *Editor*

Report of the Committee on Advertising

The Committee held one meeting and, as a result, thirty-five pages of advertising were secured for the JOURNAL this year. A one page contract running for five years was also one of the results.

WILLFORD I. KING

Report of the Committee on Social Statistics

This Committee has given attention during the year to various phases of social welfare statistics, particularly to the problem of obtaining more adequate recording of social welfare statistics and to the use of statistics in administering and evaluating social work. Five Committee meetings have been held during the year. In addition, two open meetings have been arranged by the Committee. One was a meeting of the New York Chapter of the Association, held jointly with the New York Chapter of the Association of Social Workers, on the topic "Can Dependency be Measured?" It was attended by 144 persons. The speakers were Dr. Maurice B. Hexter, Miss Margaret H. Hogg, and Dr. Willford I. King. The other is one of the sessions of this Annual Meeting, on the subject, "Evaluation of the Results of Social Experiments," the speakers being Dr. Edgar L. Sydenstricker, Mr. Porter R. Lee, and Dr. Harold A. Phelps.

The suggestion of the National Institute of Public Administration that a committee representing this Association, the public welfare departments of various states, and other interested organizations, be appointed to undertake the promotion and standardization of the collection of welfare statistics in state bureaus, has been referred to and considered by the Committee. The Committee believes that, with the assurance of interest on the part of the leading state welfare departments, such a committee could render very valuable service at this time and would approve its appointment by the Association.

Five additional members were added to the Committee during the year.

The Committee recommends that it be continued for the purpose of studying the application of statistics in public and private welfare work, and to stimulate interest within the Association in this field of statistics.

Respectfully submitted,

RALPH G. HURLIN, *Chairman*
GEORGE R. BEDINGER
WILLIAM A. BERRIDGE
STUART F. CHAPIN
KATE H. CLAGHORN
NEVA R. DEARDORFF
EMIL FRANKEL
HORNELL HART
MAURICE B. HEXTER
PHILIP KLEIN
MAURICE J. KARPF
STUART A. RICE
I. M. RUBINOW
LINTON B. SWIFT
EMMA A. WINSLOW

Report of the Committee on Governmental Labor Statistics

While the improvement and extension of employment statistics continues to be a primary interest of the Committee, attention during the past year has been focused upon wage statistics and the possibility of setting up a procedure in governmental bureaus which would result in more significant current information on wages in the United States. As an introduction to a possible program of activities for the Committee on this subject, a subcommittee was appointed, with Don D. Lescohier as chairman, to survey the history and procedure of governmental collection of statistics of wage rates in this country and in certain foreign countries. The work was done by students in a seminar at the University of Wisconsin and a report submitted to the Committee in November. Closely related to this was a preliminary examination of the employment and wage data included in the current reports of the railroads to the Interstate Commerce Commission. These preliminary analyses revealed the need for a further study of wage statistics and the setting up of recommendations by a procedure similar to that followed in working out the Committee's plan for statistics of employment. The Committee voted to take the subject of wage statistics as its immediate task for the coming year and, if possible, to secure the services of a field secretary giving full time to this work on behalf of the Committee.

Closely allied to this task was the work of another subcommittee, of which Bryce M. Stewart is chairman and which is charged with the task of studying the most practical form of record-keeping in industrial plants as a basis for reporting labor statistics to governmental bureaus. It is believed that some study of existing practice, leading to recommendations, would be a service to establishments which are called upon to report statistics of employment and wages, and that attention to satisfactory form and procedure would greatly increase the value of the data submitted to governmental bureaus. It is probable that the work on wages will begin by such an analysis of payroll practice as comes within the scope of this subcommittee.

In setting up a plan for wage statistics, as in studying employment statistics, the Committee asks: (1) What are the uses of these statistics, and hence what are the most important facts to be secured? (2) What statistics actually are significant in relation to their uses? (3) How do the different methods of wage payment in different industries and in different establishments affect the form of the data available in industrial plants, and, as a corollary, in what form should the questions be asked to make sure that comparable data are secured from different industries?

Since the Committee decided (in January, 1927) to study the subject of wage statistics, the Social Research Council has approved a project for an international study of wage data which contemplates the appointment of an American committee by the Council to take the initiative in calling an international conference on wage data; and at the same time an appropriation has been secured for the necessary preliminary work of examination of wage data in the different countries. The possibility of such an international conference makes all the more necessary the establishment of a procedure in this country based upon study of

actual industrial practice in wage payment and record-keeping as found in industry in the United States today, and it is hoped that this Committee can be prepared to coöperate with the Council's Committee in this matter.

Reports made to the Committee by the various state and federal bureaus indicate that the program for employment statistics is proceeding satisfactorily, with some improvements in the precision and the inclusiveness of the data. For example, the Federal Reserve Bank of Philadelphia, in coöperation with the Pennsylvania Department of Labor and Industry, is successfully demonstrating the possibility of collecting data on man-hours, having secured the coöperation of 60 per cent of its reporting firms in this matter. The Massachusetts Bureau of Labor Statistics, at the request of our Committee, has resumed its reports from labor unions in the building trades, securing them monthly instead of quarterly as in the past; and has added reports from building contractors, thus carrying on an experimental collection of figures from two groups in the building industries, which should help to develop a satisfactory method of collecting data for the building trades. The New York bureau is studying the problem of a new base for the employment index, more satisfactory than that of 1914.

During the year, the American Federation of Labor has been taking a very definite interest in statistics of employment; and beginning in July, 1927, labor unions in 20 cities have been making reports on unemployment. The Federation's statistician was a guest at the meeting of the Committee in November.

The membership of the Committee during the year was as follows: A. J. Altmeyer of the United States Employees' Compensation Commission; Charles E. Baldwin of the United States Bureau of Labor Statistics; Joseph A. Becker of the United States Department of Agriculture; William A. Berridge of the Metropolitan Life Insurance Company; Louis Bloch of the Bureau of Labor Statistics of California; W. Randolph Burgess of the Federal Reserve Bank of New York; R. D. Cahn of the Chicago Tribune; R. H. Coats, Dominion Statistician of Canada; Frederick E. Croxton of Columbia University; J. Frederic Dewhurst of the Federal Reserve Bank of Philadelphia; Paul H. Douglas of the University of Chicago; Leonard W. Hatch, Member Industrial Board, New York State Department of Labor; Ralph G. Hurlin of the Russell Sage Foundation; Richard Lansburgh of the University of Pennsylvania; Don D. Lescohier of the University of Wisconsin; Eugene B. Patton of the New York State Department of Labor; Roswell F. Phelps of the Massachusetts Department of Labor and Industries; Bryce M. Stewart of Industrial Relations Counsellors; Woodlief Thomas of the Federal Reserve Board; F. G. Tryon of the United States Department of Commerce; and H. H. Ward, Deputy Minister of Labour, Canada.

Respectfully submitted,

MARY VAN KLEECK, *Chairman*

Report of the Representatives of the Association in the Encyclopedia of the Social Sciences

The following report is based upon printed reports of progress prepared by the editor-in-chief, Professor E. R. A. Seligman, and the assistant editor, Dr. Alvin

S. Johnson, for the Board of Directors at its first meeting on December 15, 1927. It will be recalled that the enterprise, as outlined by Professor Seligman following the meetings of a joint committee which was and is composed of three representatives of each of the constituent Associations (formerly seven and now ten), involves the publication of about ten volumes at an estimated expenditure of about $600,000 and with a time limit of between five and six years. The editor-in-chief, unaided, has raised practically all of the money needed, and in May, 1927, the joint committee was summoned to a meeting in New York, at which plans were definitely approved and steps taken for organization of staff and board of directors. The staff includes Dr. Alvin S. Johnson as assistant editor, Dr. Alexander Goldenweiser as associate and Miss Mary E. Gleason as secretary. For legal advice, the firm of Sullivan and Cromwell, New York, was retained and the enterprise incorporated as Encyclopedia of Social Sciences, Inc. The Board of Directors is composed of 21 members, 8 lay and 13 academic, in which Wesley C. Mitchell represents the American Statistical Association. The remaining members of the corporation are the members of the former joint committee, on which the three representatives of the American Statistical Association are Professor Mitchell, R. H. Coats and Mary van Kleeck. In the Board of Advisory Editors, Irving Fisher and Walter F. Willcox are responsible for statistics.

The uses of the encyclopedia are conceived as threefold: (1) To provide a synopsis for the scholar of the progress that has been made in the various fields of social science; (2) to furnish an assemblage or repository of facts and principles for the use of the legislator, the editor, the business man and all who are interested in keeping informed of recent investigation and accomplishment; (3) to constitute a center of authoritative information for the creation of sound public opinion on the major questions which lie at the foundation of future progress and world development.

Though the work is primarily Anglo-Saxon and in management distinctively American, the most distinguished scholars of the whole world will be asked to participate. To this end, Professor Seligman interviewed European scholars in all the most important universities from Oslo to Florence in the summer of 1927. The heartiness of the coöperation offered to him was an explicit recognition of the view that this project would be of signal importance to the progress of the social sciences throughout the world.

The work done so far by the assistant editor and his staff has resulted in certain definite plans of procedure. A list of topics for the entire work has been assembled and tentative plans made for the treatment and for the space valuation of each topic. It has become clear, through the actual analysis of material, that the present divisions between the social sciences lose their distinctness and rigidity. The assistant editor predicts that when the encyclopedia is written, no one will be able to determine what proportion of the total space has gone to each science. The content of the work, the method of dealing, for instance, with allied fields like art, philology, religion, remains to be definitely worked out; but the approach is through the topics to be included rather than the branches of knowledge into which they might be expected to fall. Compactly organized topics are planned, instead of extended discussions of whole phases of a subject;

and the typical article therefore will be brief, ranging perhaps from 500 to 5,000 words. To give unity, an extended introduction is proposed, which will include, among other topics related to the plan and purpose of the publication, a history of the social sciences, analyzing by periods from the time of the Greeks the chief content, the institutional situation, the general movement of thought and the methods employed; an analysis of terminology, historical and comparative; and a rigorously selected bibliography.

As to procedure, rather than having the bulk of the work done by the staff or assigning it in large sections to editor contributors to sublet the actual composition of the several topics to others, assignments will be made directly by the central office—a method which, though laborious, will, it is expected, make the whole enterprise coöperative and secure the collaboration of the authors in thinking through the relations of the sciences, the evolution of social scientific ideas and other problems in which joint effort is essential. The expectation is that assignments will have been made for the first two volumes early in 1928; and the appearance of the first volume is forecast for the spring of 1929, a little less than two years from the time of the actual inception of the enterprise.

MARY VAN KLEECK, *Chairman*

Report of the Joint Advisory Committee to the Director of the Census from the American Statistical and American Economic Associations

In the last annual report to the two Associations represented on the Advisory Committee it was pointed out that comparatively few problems accumulate in the intercensal period which in the opinion of the Director justify his calling the Joint Committee together for conference. In 1927 the Joint Committee has been summoned twice to Washington, and sessions were held on June 17th and 18th and on November 11th and 12th. These meetings have been more important than is customary at this period in the decade because of the fact that the Director of the Census, in addition to minor problems of administration and policy in connection with current inquiries, has consulted at length with the Advisory Committee concerning the content and form of the Bill which he has been preparing to submit, through the Department of Commerce, to Congress for consideration by the Census Committee of the House, with a view to securing legislation for the Fifteenth Census.

The population of the United States, with its large decennial increase has now reached such proportions—much in excess of a hundred million—that the problem of taking an accurate census of all the inhabitants of the country has become a colossal one. In the opinion of the Director of the Census this raised a serious question whether it was not advisable to devote the activities of the Bureau at a decennial census to population alone. This and other problems he reviewed at length with the representatives of the two Associations. It is probable that from his own studies and the advice of the Committee, while no radical change will be made in the general schedules of the Fifteenth Census, the activities of the Bureau are likely to be devoted to population and agriculture, as the two main inquiries, possibly with the addition of a census of distribution, the industrial census being

now provided for by an effective biennial census. The Committee, however, is of course merely an advisory body, and the Director's final recommendations will in due season be imparted to Congress as indicated.

Your attention is invited especially to the fact that this is the ninth annual report which has been submitted, some of which, during the earlier life of the Advisory Committee, were in printed form and were documents of some length. These reports were the result of many Committee meetings held during the progress of census inquiries or tabulations, when a great number of subjects arose for consideration and thus the advice of the Advisory Committee was frequently sought. It is extremely gratifying to us, in referring to the long life of the Committee, to emphasize the fact that of the many committees of this general character which were formed during and just after the Great War, probably your representatives are the only remaining advisory group which has continued in active service—a definite contact body between the leading statistical organization of the Federal Government and the two great national Associations by their purpose and membership especially interested in statistical work. The Director has been good enough to express at frequent intervals his appreciation of the service which has been rendered and his gratification in relying upon the Committee for expert advice in connection with problems, large and small, which arise in a Bureau of the importance and ramifying interests of the Census.

It has been possible for the Committee on some occasions, by reason of local relationships, to be of practical assistance. One small problem which has given the Bureau considerable embarrassment for a number of decades has been the determination of rural population in three of the New England states, where the boundaries of towns did not permit of the sharp separation under a classification of urban as twenty-five hundred and over and rural as under twenty-five hundred population, and in consequence the figures employed for those three states have not clearly indicated the real separation of rural and urban population. Through the efforts of your Committee this problem has been met in the state of New Hampshire by drafting a Bill instructing town officers to designate boundaries in certain towns which could be used as the determination of urban population. The form of this Bill was approved by the Director as embodying an effective plan of procedure, and the Bill, at the request of the Governor, was passed by the Legislature, so that this defect in New Hampshire urban and rural classifications will be remedied at the next census, and the Bill is being used as a model for the other two states, in which it is fully expected that acts of similar import will be passed at the approaching sessions of the Legislatures of Massachusetts and Rhode Island.

The Committee desires to express its keen regret at the retirement of Professor Allyn A. Young, who, with one or two others still members of the Joint Committee, was instrumental in arranging for this successful and long-continued contact. Professor Young's departure from this country made his retirement necessary shortly before the expiration of his current term of service, and we are instructed by the Director to express to the two Associations his deep appreciation of Professor Young's long-continued service and the great value of his wide experience and great ability in dealing with Census problems.

In conclusion, the Committee desires to remind you that the value of the close coöperation now existing between the Bureau and the two Associations, which the Director has utilized with much skill and thought, depends in large measure upon the previous knowledge of the representatives of the two Associations as to Census problems, so that they can be appealed to on problems of current importance for decisions based upon previous knowledge and experience either as having been connected with the Bureau in earlier activity or as having been extensive workers upon statistical subjects dealt with by the Bureau. Success in future years of this coöperation will be assured if the two Associations will establish this requirement as an important standard for election.

Again we desire to pay our sincere tribute to the Director of the Census for the unusual sagacity and skill with which he conducts the Bureau through many trying situations, and for the untiring thought which he gives to the further development of the machinery of the Bureau and to the quality of the personnel, within the limited conditions of government service. The memory and contacts of a number of the members of your Joint Committee go back many years in census history, and in their opinion, including that of Professor Young, expressed before his departure for England, the Bureau in our time has never been conducted more efficiently than it is at present being conducted by Director Steuart.

With much respect,

For the American Statistical Association
WILLIAM S. ROSSITER, *Chairman*
ROBERT E. CHADDOCK
SEYMOUR L. ANDREW
For the American Economic Association
WALTER F. WILLCOX
GEORGE F. WARREN

Report of Committee on Institutional Statistics

The year 1927 has witnessed further progress in the field of institutional statistics.

Preliminary reports have been issued by the Federal Census Bureau giving the general results of the first annual census of patients in state institutions for mental disease, mental defect and epilepsy and of prisoners in state prisons and reformatories. The report concerning patients with mental disease covered completely 30 states; the one concerning feeble-minded and epileptics, 36 states; and the one concerning prisoners, 31 states. It is noteworthy that, compared with the data of the 1923 census, a marked increase in the ratio of institution population to general population was found in nearly every state. Work is progressing on the 1927 census of institutions, and it is expected that hereafter these annual censuses will constitute a regular part of the work of the Census Bureau.

The National Association for the Study of Epilepsy at its annual meeting in Cincinnati in May, 1927, adopted the report of its Committee on Standardization of Statistics which outlined a system of records and statistics for institutions caring for epileptics and recommended its use throughout the country. Since such meeting the Committee has prepared and printed a statistical manual and

schedule cards for the institutions and has drafted a set of 21 tabular forms to be used in the preparation of tables for annual reports. In all of this work the Committee has had the active coöperation of your Committee on Institutional Statistics. It is believed that the new system will be put into operation in all state institutions for epileptics during the coming year.

The Federal Census Bureau recently issued a comprehensive manual of instructions for compiling criminal statistics. The manual gives directions for the classification of prisoners, the making of statistical records in penal institutions, and the tabulation of data for the annual reports of such institutions. It also deals with the statistics of parole agencies, police departments, courts, prosecuting officers and probation departments. This manual is the outcome of the work that has been carried on for several years past by the Institute of Criminal Law and Criminology and the American Prison Association in behalf of better criminal statistics. A great deal of effort will still have to be made to secure the adoption of the statistical system outlined in the manual by the various agencies dealing with criminals in the several states. A few progressive states can be counted on to put the system into effect, but judging from the experience of other like movements, we cannot hope for the complete adoption of the system for many years to come.

The attention of your Committee has recently been called to a plan for better welfare statistics outlined by Dr. Carl E. McCombs, of the National Institute of Public Administration. He advocates the establishment in every state of a central bureau of welfare statistics which could coöperate with the Federal Census Bureau in preparing, in accordance with a general plan, good data in relation to the phases of public welfare in which the public is most interested. The plan outlined is an ambitious one as it presupposes willingness on the part of the several states to adopt the same plan of collection and promulgation of welfare statistics. The way for such a movement as Dr. McCombs has suggested has been prepared in part by the work done by the Federal Census Bureau and coöperative committees in the extension of the registration area, and by the work for better institutional statistics carried on by committees of this Association in coöperation with the American Psychiatric Association, the National Committee for Mental Hygiene and other similar organizations. This Committee recommends favorable action by this Association on the request of Dr. McCombs for the creation of a special joint committee to investigate the subject and to take such further action as may seem desirable.

Your Committee would again call the attention of the members of the Association to the effective work being done by the United States Census Bureau to provide better institutional statistics. Without the active coöperation of the Census Bureau the gratifying results of the past few years in this field could not have been effected.

Respectfully submitted,

HORATIO M. POLLOCK, *Chairman*
KATE H. CLAGHORN
EDITH M. FURBUSH
JOSEPH A. HILL

Report of the Committee on Membership

The Committee on Membership during this year endeavored to encourage the formation of district organizations in areas which are not now served by this important Association activity. Negotiations have been under way for the establishment of district organizations in Montreal, Toronto and Ottawa, Canada. It was the thought of the Committee that the Association should appeal to persons in statistical work in Canada, Mexico and Cuba, as well as in the United States. Some effort during the coming year will be devoted to arousing some interest in the work of the Association in these countries.

The Secretary's office has, in various ways during the past year, endeavored to stimulate the interest of individual members of the Association in securing applications from their associates in business or in teaching. This procedure has brought us most of our new members during the past year.

EDWIN W. KOPF, *Chairman*

Report of the Committee on the Classification of Membership

The Committee was formed in August, 1927. As a preliminary step, each member of the Committee was provided with a statement of the classification practice of the principal learned societies in this country and abroad. It was thought that the experience of other associations and societies, a survey of the successes and failures of classification programs in other fields, would assist the Committee in its consideration of the primary question whether the classification of the membership of our Association, according to grades or ranks, is desirable or feasible.

On the one hand, the societies in the insurance business have been successful for more than 80 years in classifying their members. This classification plan has been based primarily upon a syllabus of subjects of study for each of the grades or ranks, and upon an examination system which endeavors to determine the competence of aspirants. The chief emphasis in these insurance societies is placed upon the educational program and not upon the examination system.

For one of the very large American learned societies, a classification plan was tried 20 years ago and led to such unsatisfactory results that the plan was abandoned. Other American societies classify the members on the basis of completion of a course of professional studies in a school of recognized standing, and upon a given number of years of experience in the responsible and successful conduct of technical enterprises. The Committee feels that the subject is worthy of the most thorough consideration in fundamentals. It also recognizes the danger of offering any premature plans which fail to take into account the great diversity of statistical endeavor in respect to subject matter and method. The fact that there is no agreement, at the present time, among teachers and practitioners of statistics as to what constitutes statistical work, should lead to the utmost caution in the discussion of the problem assigned to the Committee.

EDWIN W. KOPF, *Chairman*

Report of the Activities of the Social Science Research Council

The Council at its meeting in Chicago on April 2, 1927, approved the appointment of twenty Research Fellows of the Council for the year 1927–28. At this meeting reports were received from the committees of the Council on the various research projects. There was also considerable discussion concerning more effective means of promoting research in the Social Sciences in our universities.

The Hanover Conference of the Social Sciences was held under the auspices of the Council during the three weeks from August 15 to September 2, 1927. During the first two weeks of this period, the committees of the Council and the subcommittees of the Council Committee on Problems and Policy were very active in the discussion of research projects. During the third week of the Conference the Council held its meetings to consider and pass upon the recommendations of its committees. It is fairly obvious that the Hanover Conference of 1927 was very significant as a means for surveying recent progress and promoting research in the Social Sciences.

The Chairman of the Social Science Research Council, Professor Wesley C. Mitchell, has recently made his report for the year 1926–27, a printed copy of which has been placed in the hands of each member of the Association.

H. L. Rietz, *Chairman*
Edmund E. Day
Wesley C. Mitchell

Committees for 1928

Committee on the Social Science Research Council

Edmund E. Day	Term expires December 31, 1928
Wesley C. Mitchell	" " " 31, 1929
Edwin B. Wilson	" " " 31, 1930

Committee on Fellows

Raymond Pearl	Term expires December 31, 1928
Louis I. Dublin	" " " 31, 1929
Robert E. Chaddock	" " " 31, 1930
Horace Secrist	" " " 31, 1931
Joseph E. Pogue	" " " 31, 1932

Advisory Committee on the Census

William S. Rossiter	Term expires December 31, 1928
Robert E. Chaddock	" " " 31, 1929
Willford I. King	" " " 31, 1930

Committee on the Journal of Social Science Abstracts

Frank A. Ross, *Chairman* — Edmund E. Day
Ralph G. Hurlin

Joint Committee on Standards for Graphics

Karl G. Karsten, *Chairman* — Irving Fisher
Frederick E. Croxton — Arthur H. Richardson

Membership Committee

Edwin W. Kopf, *Chairman* — Reuben D. Cahn
John H. Cover

Special Committee to Coöperate with Committee on Scientific Methods of the Social Science Research Council

Robert E. Chaddock, *Chairman* — Frederick C. Mills
Leo Wolman

Advertising Committee

Philip J. Warner, *Chairman* — L. H. Sloan

Committee on Institutional Statistics

Horatio M. Pollock, *Chairman* — Emil Frankel
Frank Bane — Edith M. Furbush
Kate H. Claghorn — Joseph A. Hill
Neva R. Deardorff — Carl E. McCombs
Benjamin Malzberg

Committee on Governmental Labor Statistics

Mary van Kleeck, *Chairman* — L. W. Hatch
A. J. Altmeyer — Ralph G. Hurlin
Charles E. Baldwin — R. H. Lansburgh
Joseph A. Becker — Don D. Lescohier
W. A. Berridge — E. B. Patton
Louis Bloch — Roswell F. Phelps
Reuben D. Cahn — H. V. Roelse
R. H. Coats — Bryce Stewart
Frederick E. Croxton — Woodlief Thomas
J. Frederic Dewhurst — F. G. Tryon
Paul H. Douglas — H. H. Ward

Committee on Social Statistics

Ralph G. Hurlin, *Chairman* — Hornell Hart
George R. Bedinger — Maurice B. Hexter
W. A. Berridge — Maurice J. Karpf
F. Stuart Chapin — Philip Klein
Kate Claghorn — Stuart A. Rice
Neva R. Deardorff — I. M. Rubinow
Emil Frankel — Linton B. Swift
Emma A. Winslow

Joint Committee on the Encyclopedia of the Social Sciences

Wesley C. Mitchell, *Chairman* — R. H. Coats
Mary van Kleeck